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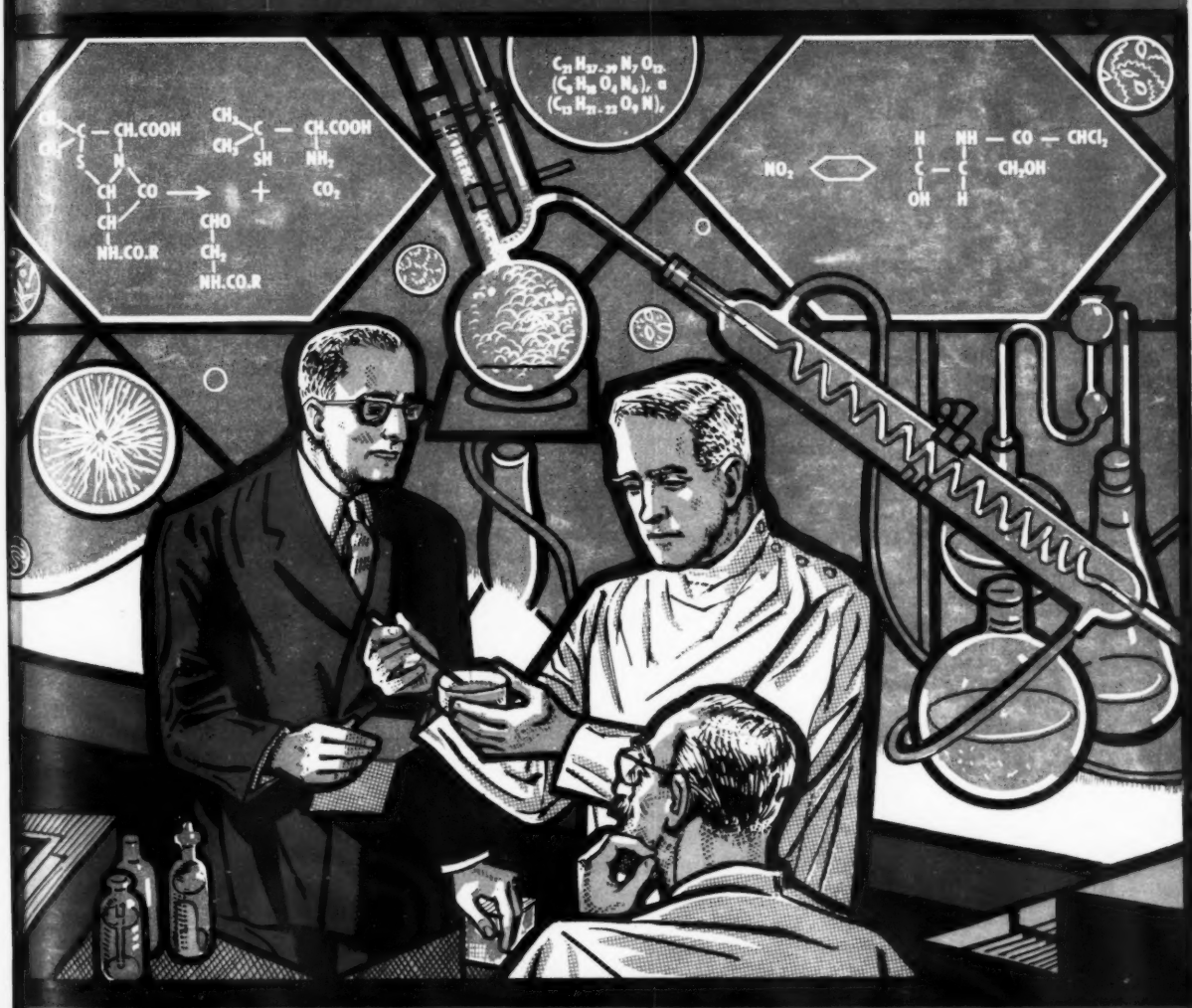

ERIES FOR MEDICINE—DUGGAR, FLEMING, WAKSMAN

Table of Contents on Pages A-5 and A-6

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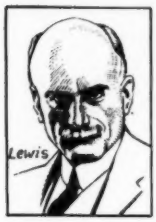

The Electrocardiogram in Potassium Disturbance

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DISTURBANCES in potassium metabolism are associated with definite changes in the electrocardiogram. Individual clinical conditions in which there are potassium imbalance and certain characteristic cardiographic findings are reported in the literature.[1-4] These conditions include diabetic acidosis, uremia, Addison's disease with desoxycorticosterone acetate intoxication, diarrhea, vomiting, dehydration, parenteral administration following surgical procedures, and rarer conditions such as familial periodic paralysis.

The purpose of this paper is to reemphasize the importance of the cardiogram in the diagnosis of potassium imbalance in the clinical entities referred to above; to cite clinical examples of each condition accompanied by illustrative tracings; and finally, to indicate that characteristic cardiographic changes due to variations in potassium metabolism occur before clinical manifestations are obvious.

The effect of altered potassium concentration on the electrocardiogram may be summarized as follows:[1-6]

1. Decreased serum potassium (hypopotassemia or hypokaliemia) produces lowering to inversion of T waves and prolongation of the Q-T interval, determined at constant rate since Q-T varies with the rate. It should be noted that low serum calcium may also prolong the Q-T interval, but the T waves are not affected in these instances.

2. Increased serum potassium (hyperpotassemia or hyperkaliemia) produces T wave elevation. There is also a decrease in the size of the R and an increase of the S components, with disappearance of the P wave. S-T is obliterated and the T wave arises directly from S. The QRS complex widens and finally cardiac arrest occurs.

These changes are most obvious in the precordial leads.

Normal serum potassium in our laboratory is 4.2 to 5.5 mEq. per liter. Paresthesias and flaccid paralysis have been described in states of high serum potassium.[1] The clinical state of hypopotassemia occurs at serum levels of 2.6 to 3.0 mEq. per liter.[5-8] This syndrome may appear as an acute episode of skeletal weakness, finally with paralysis of the diaphragm and the intercostals. In other instances there is a more diffuse and less acute symptom complex accompanied by drowsiness, weakness, chronic ileus with moderate distention, anorexia, oliguria, and usually some peripheral edema.

The following case reports illustrate various diseases in which potassium metabolism is disturbed and in which specific cardiographic changes are observed with variations in potassium levels. Since they are most striking, only the precordial leads will be shown.

RENAL FAILURE

C. P., a 32-year-old white male, was admitted with hyperthyroidism (basal metabolic rate + 48 per cent). On admission, all blood studies, including cholesterol, were normal. An electrocardiogram taken the day after admission was within normal limits (Figure 1A). Prior to surgery, four days after admission, the patient suddenly became febrile, icteric, and developed congestive failure. His nonprotein nitrogen that day was 100 mg. per 100 cc. of blood, and his serum potassium,

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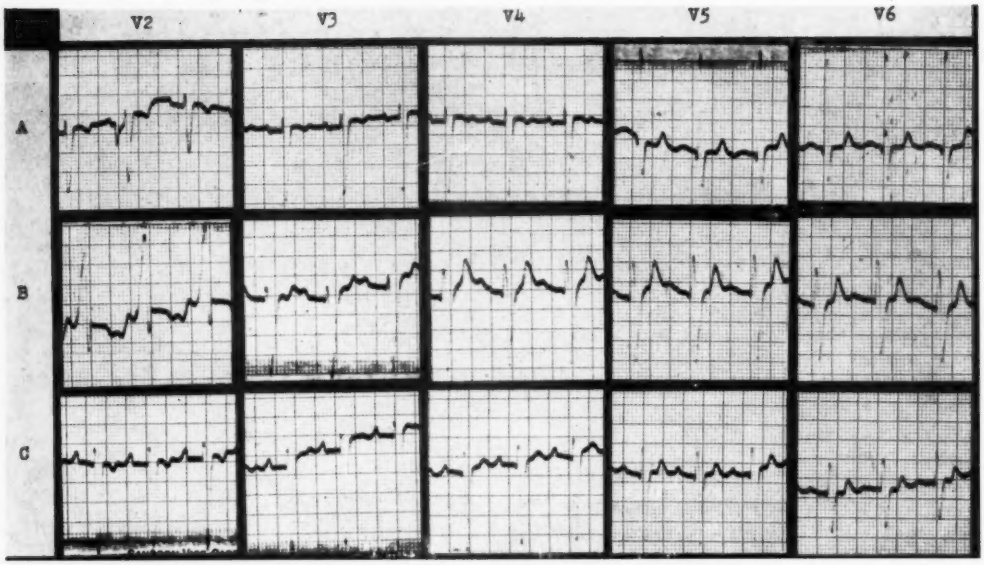

FIGURE 1. RENAL FAILURE. Precordial leads: A. Tracing taken on day of admission, before renal failure developed. Note height of T in V4, V5, V6. B. Tracing taken four days later, after development of renal failure. Note high peaked T in V4, V5, V6, as compared with A. C. Tracing taken after return of normal blood nitrogen and disappearance of renal failure. Note T in V4, V5, V6 of lower amplitude, similar to that found in A.

7.7 mEq. per liter. The electrocardiogram the same day showed peaked T waves in the precordial leads (Figure 1B).

With treatment of the congestive failure (oxygen, mercurial diuretics, and digitalization) his symptoms gradually subsided. The nonprotein nitrogen and serum potassium were reduced toward normal levels and the electrocardiogram showed return of the T waves to their previous height (Figure 1C).

Comment—Normally potassium is balanced in man by a dietary intake equalized by an excretion of 80 per cent in the urine and of 20 per cent in the feces. Renal excretion is so effective that it is virtually impossible to raise the serum potassium by oral administration of this substance in subjects with normal kidneys.[1,4] In cases of renal failure, however, potassium accumulation and intoxication may occur.

DIABETIC ACIDOSIS

R. J., a 38-year-old Negro female, was admitted to the hospital with diabetic acidosis. Blood sugar on admission was 366 mg. per 100 cc. of blood. The patient had 4+ glycosuria and acetonuria. The electrocardiogram on admission revealed tall peaked T waves in the precordial leads, compared to a routine tracing taken several months previously (Figure 2A and B).

The patient was treated in the following eighteen hours with one liter 1/6 molar lactate solution, five liters 10 per cent glucose in physiologic saline and a total of 500 units of regular insulin by intramuscular and intravenous routes. Potassium was withheld until the electrocardiogram revealed deeply inverted T waves throughout. At that time the serum potassium was 3.8 mEq. per liter (Figure 2C). In the following eighteen hours the patient received a total of 8 gm. of potassium chloride, orally and intravenously. The electrocardiogram was repeated and showed normal T waves throughout (Figure 2D).

Comment—Potassium is intimately related to glucose metabolism. It is known that during formation of glycogen in the liver, potassium is deposited in a predictable ratio with the polymerized glucose.[9] When glycogen is broken down into glucose (glycogenolysis), potassium is liberated into the extracellular fluid.

Uncontrolled diabetes mellitus is accompanied by increased glycogenolysis, resulting in movement of potassium into the interstitial fluid and depletion of liver glycogen. Therefore, in the untreated diabetic acidotic patient the serum potassium, as well as the blood sugar, is elevated. During treatment of the acidotic patient, however, the serum potassium is actually depressed below normal levels by several mechanisms.[5,6,8]

Administration of insulin causes glycogenesis

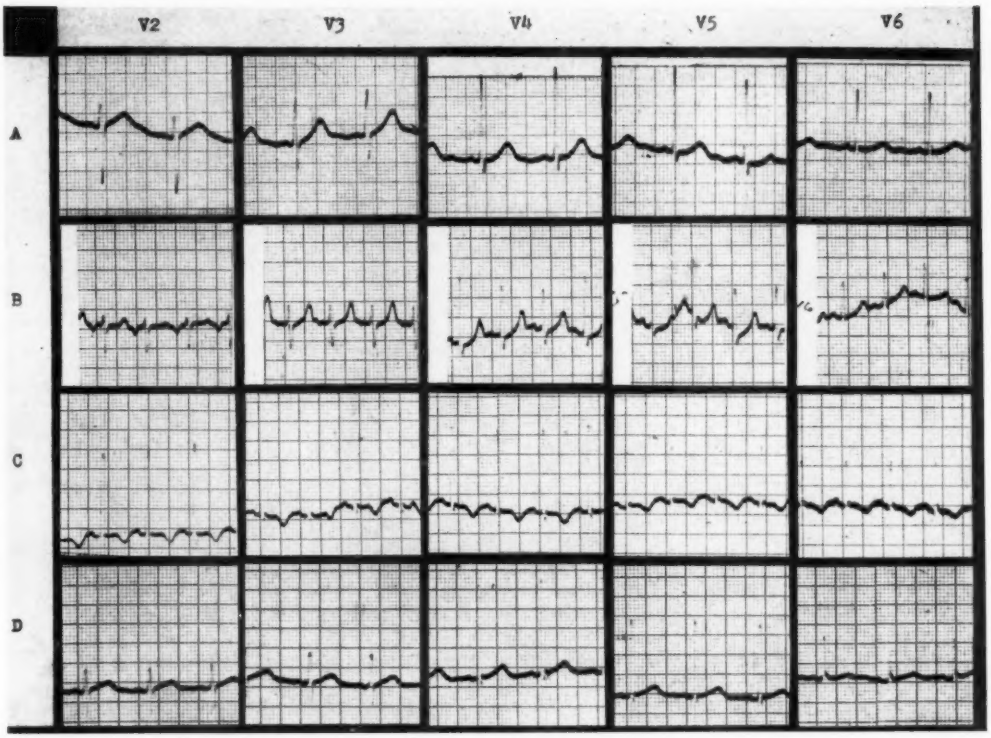

FIGURE 2. DIABETIC ACIDOSIS. Precordial leads: A. Tracing from patient with diabetes mellitus. B. Tracing on same patient during diabetic acidosis. Note still positive T waves. C. Tracing taken within eighteen hours after institution of treatment for acidosis, resulting in hypopotassemia. Note inverted T throughout. D. Tracing taken after addition of potassium chloride to treatment, restoring T waves to normal.

with lowering of serum potassium as mentioned before. In addition, intravenous infusions cause dilution of blood, increased circulating volume and diuresis, each causing an absolute or relative loss of potassium. While sodium is replaced by physiologic saline and lactate solutions, potassium is not, and hypopotassemia occurs. The correction of the acidosis, sometimes carried to actual alkalosis, also alters cell ions. It has been shown that a rise in serum bicarbonate is accompanied by high cell sodium and low cell potassium.[10] This condition may be prevented by the administration of potassium salts, either orally or intravenously.

DEHYDRATION, VOMITING, AND DIARRHEA

M. B., a 59-year-old white female, was admitted with pyrexia of unknown origin. She had an eruption of the skin and mucous membranes, cough, vomiting of three days' duration, conjunctivitis, and a history of handling wild rabbits. The patient had not drunk nor eaten for several days because of nausea and painful lesions of the mouth. A diagnosis of tularemia was made, and the patient was started immediately on large amounts of streptomycin, aureomycin, and penicillin. Within eighteen hours after admission, the patient was afebrile and symptom-free, except for the skin and mouth lesions which persisted for several days and prevented oral feeding.

The patient received two liters of 10 per cent glucose in physiologic saline daily, and only water by mouth. Four days after admission a routine electrocardiogram was taken, showing flat to inverted T waves in all precordial leads and a prolonged Q-T interval (Figure 3A). Serum potassium on the same day was 3.9 mEq. per liter. Potassium chloride was then administered, 4 gm. daily, and in two days the electrocardiogram and serum potassium were repeated. At this time the serum potassium was 4.9 mEq. per liter and the electrocardiogram showed low upright T waves (Figure 3B). In two more days with continued potassium chloride therapy the electrocardiogram was repeated and showed normal T waves throughout (Figure 3C).

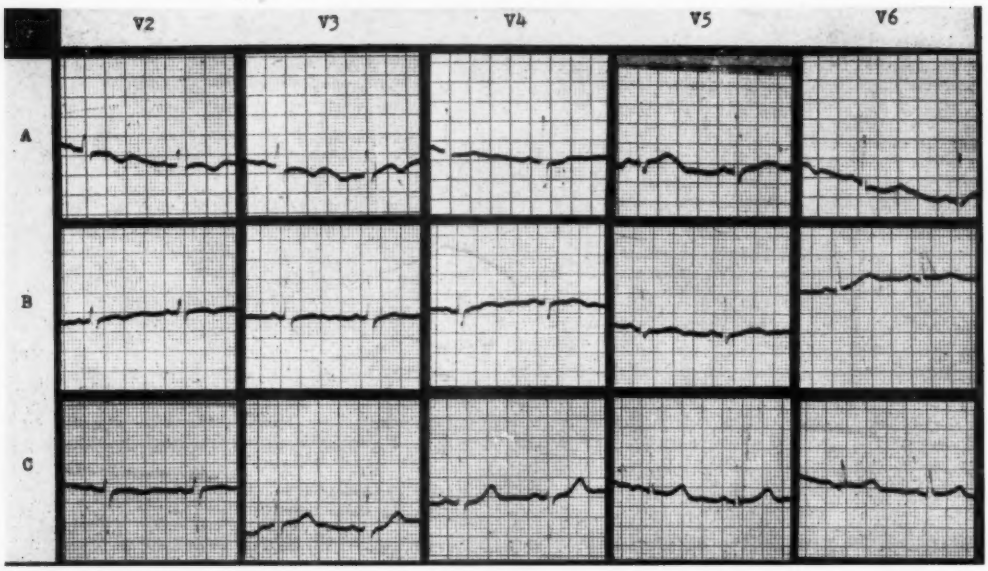

FIGURE 3. STARVATION AND DEHYDRATION. Precordial leads: A. Tracing taken four days after admission of patient with tularemia and severe dehydration. Note flat to inverted T waves throughout. B. Tracing after two days of potassium chloride treatment. Note tendency towards more positive T waves. C. Tracing four days after institution of potassium chloride therapy. Note normal T waves.

Comment—Electrolytes are lost in large amounts by vomiting and diarrhea. This is accentuated by a reduced intake. Although the loss of chloride ion is a chief concern in vomiting, considerable amounts of cations are lost as well from the gastric contents and the succus entericus. Especially in infants, acute or chronic diarrhea can cause profound acidosis with loss of fixed base, in addition to rapid dehydration.[11-13] Frequently the replacement of individual cations is forgotten in the correction of both acidosis and dehydration, and sodium alone, as molar lactate solution, is administered instead of a more physiologic solution containing calcium and potassium as well. The use of potassium chloride has reduced infant mortality tremendously in diarrhea.[14]

POSTOPERATIVE CONDITIONS

E. M., a 56-year-old white female, was admitted with roentgenologic evidence of a mass at the cardiac end of the stomach. A routine preoperative electrocardiogram was taken and was within normal limits (Figure 4A). At operation the mass was found to be an infiltrating carcinoma, and a total gastrectomy was performed.

The patient was given intravenous fluids postoperatively, consisting of Amigen, molar lactate, and 5 per cent glucose in physiologic saline. She had Wangensteen suction (on and off one hour each) and nothing by mouth for four days. At that time the electrocardiogram was repeated and showed lowered T waves, especially in the precordial leads (Figure 4B). Serum potassium the same day was 3.3 mEq. per liter. The patient was started on oral feedings the following day, so no further serum potassium determinations were made.

Comment—Mechanisms similar to those found in vomiting and dehydration cause hypopotassemia in postoperative patients, especially in serious gastrointestinal cases who have Wangensteen suction, nothing by mouth, and intravenous feedings only of saline, glucose, and protein hydrolysates.[15] Large amounts of potassium are lost by the suction tube and are not replaced. Saline infusions and intravenous glucose cause a high rate of water and potassium excretion in the urine even in normal subjects. The rate of excretion is markedly increased in postoperative patients, especially those who have undergone major procedures.[16,17] Hypopotassemia results, accompanied by a low plasma chloride refractory to treatment with saline, and a high plasma bicarbonate. These respond to the administration of potassium salts.

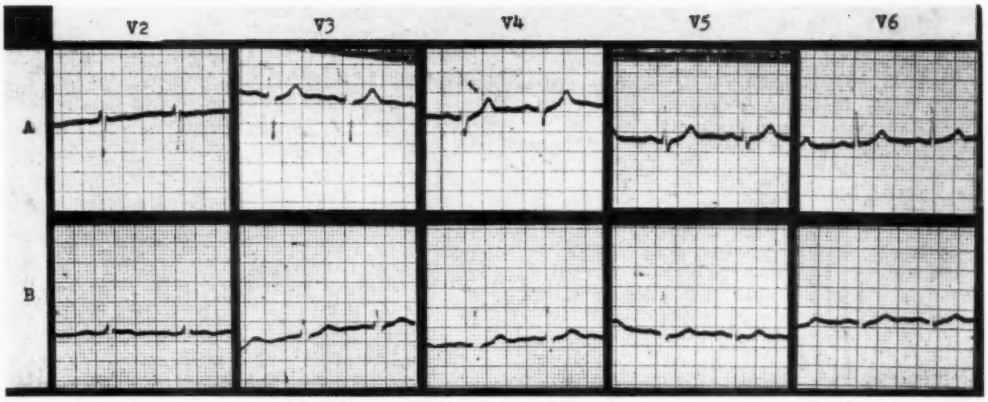

FIGURE 4. POSTOPERATIVE. Precordial leads: A. Tracing taken before patient had gastrectomy. Note normal T waves. B. Tracing taken three days after operation. Postoperative course led to potassium depletion with tendency toward flattening of T waves.

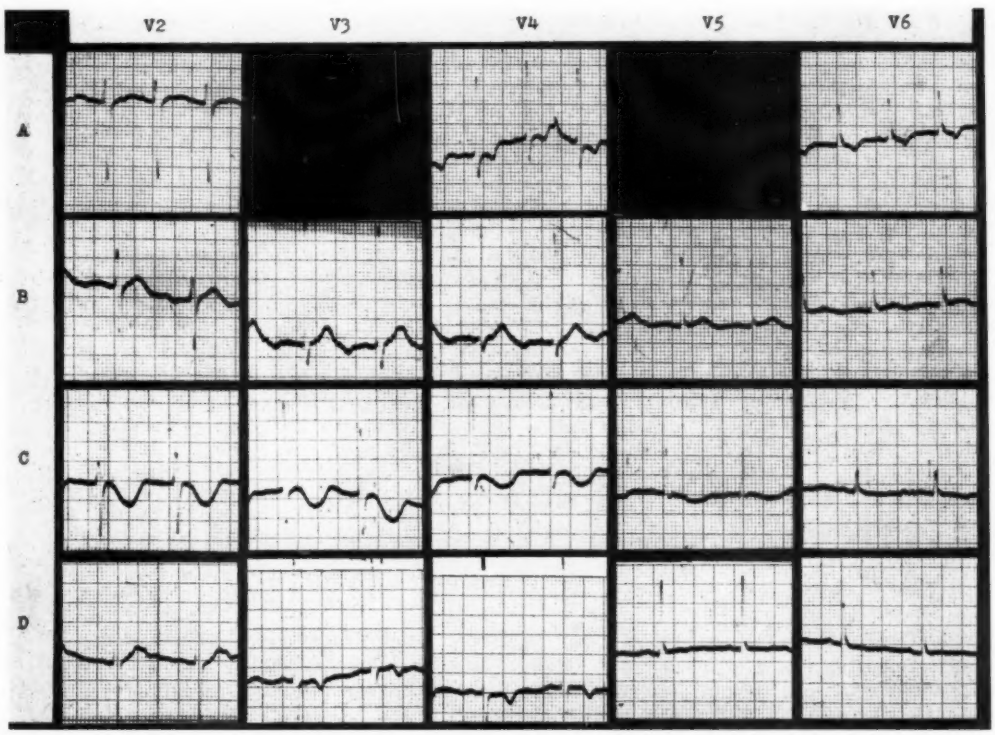

FIGURE 5. DESOXYCORTICOSTERONE ACETATE INTOXICATION. Precordial leads: A. Tracing taken on patient in Addisonian crisis. Note negative T waves due to coronary insufficiency. Serum potassium upper limits of normal. B. Tracing taken during treatment of crisis. Potassium level lower than in A, but within normal limits. C. Overtreatment with desoxycorticosterone acetate leads to acute hypopotassemia, with markedly slurred inverted T waves and prolonged Q-T interval. D. Tracing taken four months later following recovery from hypopotassemia. Note coronary insufficiency pattern similar to that on original admission.

ADDISON'S DISEASE

H. H., a 44-year-old Negro male, was admitted to the hospital in Addisonian crisis in shock.[18] On admission his serum sodium was 136 mEq. per liter, his potassium 5.4 mEq. per liter. The electrocardiogram on admission was suggestive of coronary insufficiency, with inverted T waves (Figure 5A). The patient was treated with plasma, glucose in saline, whole adrenal cortical extract, and Cortate (desoxycorticosterone acetate). In four days his electrocardiogram showed upright T waves throughout (Figure 5B).

The following day the patient developed congestive failure. Venous pressure was elevated; an x-ray of the chest revealed pulmonary congestion and marked enlargement of the heart compared to a previous film taken shortly after admission. Plasma chloride (as sodium chloride) that day was 830 mg. per 100 cc., serum sodium 138 mEq. per liter, and serum potassium 3.0 mEq. per liter. The electrocardiogram that day showed slurred inverted T waves throughout with prolonged Q-T interval (Figure 5C). Sodium was immediately restricted (patient had been on high salt diet), the Cortate discontinued, and in three days the patient had a normal venous pressure and no signs of congestive failure. On x-ray his heart was reduced to normal size. The electrocardiogram at this time showed a normal Q-T interval and narrow inverted T waves which were present at discharge one month later and on a follow-up electrocardiogram eight months later (Figure 5D).

Comment—The electrocardiographic changes in Addison's disease, even during crisis, are not characteristic; nor are the serum potassium levels particularly characteristic. The pathologic physiology in electrolyte imbalance in Addison's disease primarily is that of reduced sodium due to its increased urinary excretion, and not necessarily elevated potassium. Usually, therefore, abnormally high levels of serum potassium are not attained. However, in the overtreatment of Addison's disease with desoxycorticosterone acetate, the reverse may occur, viz., the patient develops intoxication from desoxycorticosterone acetate overdosage, resulting in hypopotassemia by increased excretion of potassium in the urine. If hypopotassemia is maintained, permanent myocardial damage will result.[19]

DISCUSSION

POTASSIUM is primarily an intracellular cation. Its concentration in cells is about twenty times that in serum.[20] Cell potassium is only partially ionized, some being combined with protein, phosphates, and probably other complexes. Potassium may leave the cell when the cell protein is broken down, during exercise, and in periods of dehydration. Some balance studies show evidence of reciprocal exchange of cell potassium for sodium. But the fact remains that potassium is primarily an intracellular cation. Yet the electrocardiographic changes found in instances of electrolyte imbalance involving potassium have been ascribed to changes in serum potassium.

Would it not be more logical to attribute the electrocardiographic changes to variations in intracellular potassium, and more narrowly to myocardial potassium? The electrocardiogram measures differences of potential in myocardium, not the chemical constituents of serum. Moreover, the most sensitive electrocardiographic changes in potassium imbalance are amplitude variations in the T wave, and time alterations of the Q-T interval. The former represents ventricular repolarization, and the latter, the time required for ventricular depolarization and repolarization. Instead of correlating serum potassium levels to electrocardiographic changes then, it would be more correct to say that changes in concentration of myocardial potassium alter myocardial depolarization and repolarization. The exact mechanism is unknown, although it may be due simply to increase or decrease of total myocardial cation.

SUMMARY

1. Instances of electrolyte imbalance have been presented containing both hyperpotassemic and hypopotassemic states with typical electrocardiographic changes.

2. The most sensitive electrocardiographic change was found in the T wave. The Q-T interval was the next most sensitive finding.

3. In all instances the electrocardiogram correlated with the tendency in serum potassium variation.

4. All deficiencies of potassium were detected by the electrocardiogram before they reached levels causing symptoms or signs of such deficiency.

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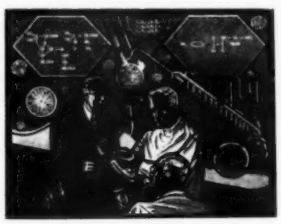
COVER FEATURES DISCOVERERS OF ANTIBIOTIC DRUGS



THERE HAVE BEEN many accounts of the discoveries made in recent years in the field of antibiotic and chemotherapeutic agents, and there will undoubtedly be others as new products are found and new uses proved for them as well as those now known.

The advent of these potent drugs truly marked a new era in medical treatment for with their application have come new methods in the treatment of many diseases against which there were formerly no specific agents. Furthermore, these antibiotics and chemotherapeutics have proved valuable adjuncts to pre- and postoperative care in the prevention and control of infectious processes.

Alexander Fleming (penicillin), Selman Waksman (streptomycin) and Benjamin M. Duggar (aureomycin) are three of the leading figures in the remarkable development of the "miracle" drug story, but in featuring these men on this month's cover, *Postgraduate Medicine* offers tribute to all the men and women whose lives are devoted to the discovery, development and use of these powerful weapons in the physician's never-ending struggle against disease.

Reprints of Edmund Kopietz' cover painting, mounted and ready for framing, are available on request to *Postgraduate Medicine,* 516 Essex Building, Minneapolis 3, Minnesota. Price $1.00.

Surgical Treatment of Duodenal Ulcer

LOUIS T. PALUMBO, R. E. PAUL, MARTIN LEIBOVITZ AND H. J. FISHMAN*

VETERANS ADMINISTRATION HOSPITAL, DES MOINES

MODERN gastric surgery made its first appearance in 1879 when Pean reported having performed a pylorectomy on a patient with a pyloric carcinoma.[3,14] In 1881 Billroth of Vienna reported his first pylorectomy, a procedure which subsequently came to be known as the Billroth I procedure. Later the same year, Woeffler, a student of Billroth, attempted a similar procedure in another case of gastric carcinoma; however, he found the lesion unremovable and the procedure impractical, and at the suggestion of his assistant, Nicoladoni, he short-circuited the obstruction, using a long loop antecolic gastroenterostomy.

In 1886, the operation now known as pyloroplasty was first performed by Heineke and later by Mikulicz. This was further modified by Finney in his gastroduodenostomy procedure, first described in 1902.

Because of the difficulties experienced with the pylorectomy, or Billroth I procedure, modifications were introduced. The cut ends of the stomach and duodenum were closed and the continuity of the gastrointestinal tract was reestablished by means of a retrocolic gastroenterostomy. This became known as the Billroth II procedure and stemmed from the observation that a previously planned two-stage procedure was completed at one sitting. Von Hacker was the first to propose, in 1885, a modification of the Billroth II procedure, consisting of anastomosing the open end of the remaining portion of the stomach to a loop of jejunum, and this suggestion was first carried out by Kronlein two years later. The retrocolic anastomosis was performed by Roux in 1893 and Brown in 1894; in the latter instance, the procedure was similar to the Billroth II operation except for the loop of jejunum being placed retrocolically.

Due to the possible stenosis at the site of the anastomosis, Polya initiated a retrocolic anastomosis of the cut end of the remaining stomach to the proximal jejunum, the so-called "end in side" technic, and published his method in 1911.[5] This procedure became known as the Polya-Billroth II and later was performed either ante- or retrocolic. Reichel performed the so-called Polya procedure and reported it three years before Polya, although the latter claimed priority in actual performance. Subject to minor variations, it is the standard operation of choice in the surgical treatment of both gastric and duodenal ulcers today.[9]

Earlier procedures, such as excision or cauterization of the ulcer, with or without gastroenterostomy, pyloroplasty of various types, sleeve resection, excision of the pylorus and antrum, and partial gastrectomy without removal of the pylorus, have given place to partial gastrectomy in which at least 60 per cent of the stomach including all of the lesser curvature and all of the pylorus is excised. Gastroenterostomy likewise has been to a large extent replaced by partial gastrectomy, the newer school of surgeons having profited from the results of large series of patients subjected to this procedure with recurrence of gastrojejunal or marginal ulcer reported as high as 34 per cent.[8]

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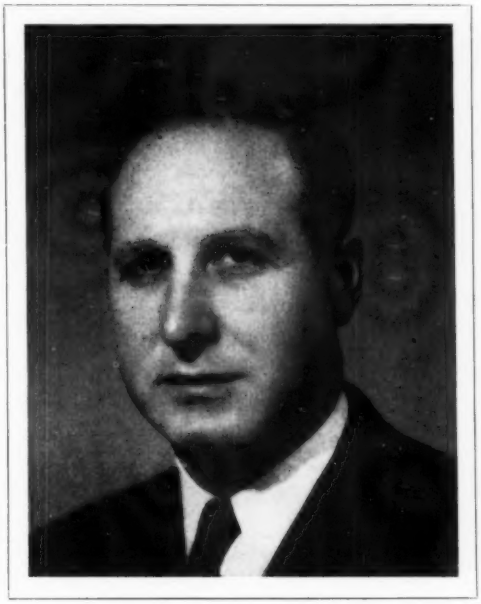

LOUIS T. PALUMBO

INDICATIONS FOR SURGERY

Indications for surgical treatment applied in our cases are those that are generally accepted by most clinics, and consist briefly of pyloric obstruction due to cicatricial stenosis, persistent or repeated massive hemorrhage, intractability, or perforation. All of our cases of acute perforation treated surgically had simple closure of the perforation and are not included in the following series.

MORTALITY RATE

In competent hands, the operative mortality accompanying partial gastrectomy is comparable to that previously realized in gastroenterostomy (Table 1). This marked reduction over previously reported mortality figures is largely accounted for by improved pre- and postoperative care, judicious use of the antibiotics and sulfonamides, and improvement in surgical technic.

There are a number of considerations as to operative technic which must be closely observed if comparable mortality rates are to be obtained. Many of these warrant emphasis and are also discussed in another part of this paper. In the ligation and sectioning of the gastrocolic omentum it is of prime importance to avoid including a portion of the transverse mesocolon in the ligature since ligation of the midcolic artery almost invariably causes gangrene of the transverse colon if not recognized. Mobilization of the first portion of the duodenum likewise is beset with dangers because of the proximity of the common duct and even the portal vein and hepatic artery.

Frequently, chronic duodenal ulcers are surrounded by a mass of dense fibrous tissue, contraction of which causes varying degrees of abnormal displacement of these structures, and since their identification is often very difficult, it behooves the operator to keep the dissection close to the duodenum. The possibility of the presence of an accessory pancreatic duct also should be kept in mind since if such a duct is transected and not recognized, digestion of the sutures in the duodenal stump may occur.

Closure of the duodenal stump is one of the most important steps in the operation since, in most series, it is a leak from the stump with subsequent peritonitis that is the greatest single cause of postoperative mortality. Many variations in the technic of closure are reported in the literature; however, all revolve around the prerequisite that sufficient mobilization of the duodenum be carried out distal to the proposed point of transection to allow accurately placed sutures to be taken in healthy tissue.

OPERATIVE TECHNIC

We have used an elliptical, transverse, transrectus, supraumbilical incision in all cases, employing fine silk for hemostatic ligatures. The cases were operated under general intratracheal anesthesia, except for the first group of about 15 patients who were anesthetized by a high spinal and intravenous pentothal. Only catgut is used within the peritoneal cavity. After exploration of the peritoneal cavity, the left gastric vessels and the left gastro-epiploic vessels are each ligated en masse with transfixation sutures at the proposed site of stomach transection. Approximately 75 per cent of the stomach is resected, including practically all of the lesser curvature. The gastrocolic omentum and gastrohepatic omentum are then separated from the distal three-fourths of the stomach and first portion of the duodenum, following which a Roosevelt clamp is placed across the stomach

TABLE 1
RESULTS OF PARTIAL GASTRECTOMY

AUTHOR	NUMBER OF CASES	LESION AT TIME OF SURGERY						YEARS FOLLOWED	OPERATIVE MORTALITY, PER CENT	CASES FOLLOWED
		DUODENAL ULCER	MULTIPLE DUODENAL ULCERS	SECONDARY ULCERATION	GASTRIC ULCER	COMBINED DUODENAL AND GASTRIC	NOT SPECIFIED			
Allen[3]	187								4.8	129
Brooks[2]	57	57						1-10	1.8	48
Hinton[4]	162	162						0-12	3.7	135
Huer[5]	83						83	2-12	6	76
Kiefer[6]	222	146		27	49					217
King[7]	75						75		0	
Mage[10]	502	366		136				2-17		502
Marshall[11]	318			62			256	0-7	3.4	
Miller, G. G.[12]	230						230	0-5	3	173
Miller, T. G.[13]	73	73						0-7	1.4	73
Rienhoff[16]	260	65	195					2-10	2	265
Saunders[17]	61	25	36					0-11	1	48
Skinner[18]	62	62						0-4	3.2	62
St. John[20]	394						394		4.5	344
Steinberg[19]	350			68			282	1-23	2	280
Walters[21]	212	144		25		43		0-10	1.9	197
Wangensteen[22]	300						300		2.3	

proximal to the site of transection and a Payr clamp distal to this site. The stomach is then amputated and is used as a tractor in the dissection of the proximal duodenum from the head of the pancreas and surrounding scar tissue.

In all of our cases the ulcer, if active, and if not, the healed ulcer base and immediate fibrous tissue were dissected free and excised. This necessitated a careful and meticulous dissection and in many instances the open duodenal method was used in order to secure direct visualization of the ulcer site and diseased tissue and to facilitate the dissection.

Closure of the stump is not a stereotyped procedure in our hands, variations in technic being adapted to the amount of normal duodenum that can be safely mobilized and to the proximity of the common duct and ampulla of Vater. Generally, however, the duodenum is transected just distal to the indurated scarred area around the ulcer, anchor sutures are placed in the superior and inferior aspects of the cut end of the duodenum, and two layers of a continuous Lembert suture are placed, following which the stump is buried in the pancreatic capsule by interrupted sutures.

An antecolic gastrojejunal anastomosis is car-

TABLE 1 *(continued)*

RESULTS OF PARTIAL GASTRECTOMY

ULCER REMOVED, PER CENT	OPERATIVE PROCEDURES	POSTOPERATIVE RESULTS			PROVED RECURRENCES	PRESUMPTION RECURRENCES
		EXCELLENT, PER CENT	IMPROVED, PER CENT	POOR, PER CENT		
	Incomplete removal of ulcer, 139. Ulcer, left in situ, 18. Modified Finsterer, 27. Two-stage, 3	86.8	6.3	6.9	2.3	2.3
100	All of lesser curvature removed. Retrocolic anastomosis with "adequate" afferent limb	95	3	2	0	0
100	65-70 per cent stomach removed. Antecolic short loop anastomosis	90	7.8	2.2	.7	1.5
	Hofmeister, Polya, and Billroth II	89.4		10.6	2.6	7.9
	Classical Finsterer, 30. Radical resection, Hofmeister type, long loop antecolic anastomosis, 192				13.3	10
					3.4	8.0
	2/3 of stomach removed. Antecolic Hofmeister type anastomosis	Most patients			0	1.3
	Stomach resection to above re-entrant angle. Hofmeister anastomosis, usually retrocolic	82.1	10		6.5	1.4
100	"High subtotal resection"					
		90	10		0	
	Subtotal gastrectomy with antecolic Balfour or Hofmeister anastomosis	79.4	13.7	4.1	1.9	1.3
25	50 per cent of stomach removed, Polya type antecolic anastomosis	25	78 at present*	8**	9	26
100	Polya anastomosis, generally retrocolic in high resection. 55-65 per cent stomach resected	69	21		8	
	Hofmeister modification of Polya in 57 cases, with anterior anastomosis Billroth II in 5 patients	77.5	19.3	3.2	3.2	0
	Generally Polya type—antecolic anastomosis recently	78.9	18.9	11	.6	
	Classical Finsterer exclusion, 14. Standard radical retrocolic short proximal loop, 336				21.7	
		Most patients			0	.6
	More than 1/3 stomach removed generally with first part of duodenum. Polya type anastomosis, usually retrocolic	83.5	14		2.0	.5
	At least 3/4 stomach resected. Short afferent loop small cuff or Finsterer type with removal of antral mucosa				.3	2.6

*8.4 per cent reoperated.
**1.1 per cent reoperated.

ried out, employing a short afferent loop, in most cases about 4 inches in length. The site of the jejunal anastomosis is brought between the small intestinal side of the Roosevelt clamp, generally, but not always with the afferent loop to the lesser curvature, thus forming an isoperistaltic anastomosis. Prior to opening the jejunum the first posterior row of sutures is placed, approximating serosa to serosa and using a continuous suture. Generally the entire cut end of the stomach is anastomosed to jejunum; however, on a few occasions in which the level of resection was quite high, or in which the stomach was dilated, a modified Hofmeister technic has been employed, closing the upper one-third of the gastric lumen.

After approximating gastric and jejunal serosa, the jejunum is opened along its antemesenteric border and the second posterior layer of sutures is placed as a continuous hemostatic mattress suture. This suture is continued anteriorly using a Connel stitch, thus forming the first anterior layer. The suture used for the first posterior layer is then continued anteriorly as a

TABLE 2

SUMMARY OF CASES OF DUODENAL ULCER TREATED BY PARTIAL GASTRECTOMY

CASE	AGE (YEARS)	CHIEF SYMPTOMS	DURATION OF SYMPTOMS (YEARS)	PREOPERATIVE FASTING GASTRIC ACIDITY	DATE OF OPERATION
1	50	Pain and nausea	30	Total — 66° Free — 53°	8-16-46
2	53	Pain, weight loss. Perforated ulcer 7/31/46. One episode of bleeding	6		8-30-46
3	62	Epigastric pain. Nausea and vomiting	21	Total — 55° Free — 41°	9-5-46
4	58	Epigastric pain. Nausea, vomiting. Perforated ulcer	14	Total — 43° Free — 23°	10-1-46
5	39	Pain, vomiting, distention. Hematemesis once. Weight loss 10 lbs. last month	20	Total — 55° Free — 39°	10-8-46
6	50	Epigastric pain. Loss of appetite	6	Total — 64° Free — 41°	10-14-46
7	53	Pain. Weight loss. Tarry stools	20	Total — 51° Free — 26°	11-1-46
8	63	Epigastric pain, nausea, vomiting	1		11-8-46
9	21	Pain. Massive hemorrhage	1½		11-26-46
10	49	Perforated ulcer September 1946	20	Total — 54° Free — 42°	12-3-46
11	51	Pain. Tarry stools. Perforated ulcer July 1946	11		12-6-46
12	41	Hematemesis, epigastric pain, weakness. Tarry stools	10		12-31-46
13	63	Epigastric distress. Vomiting	13	Total — 54° Free — 24°	1-3-47
14	22	Epigastric pain, hemoptysis, tarry stools, nausea, vomiting	3	Total — 75° Free — 41°	1-7-47
15	33	Pain. Two ruptured ulcer episodes	3		1-7-47
16	42	Ruptured ulcer in 1945. Nausea, vomiting, epigastric distress	2	Total — 59° Free — 40°	1-9-47
17	51	Pain. Massive hemorrhage	30		1-14-47
18	32	Pain. Two hemorrhages	2		1-16-47
19	48	Epigastric pain. Nausea, vomiting	4		2-17-47
20	22	Pain. Night pains. Two hemorrhages	7		2-22-47
21	54	Nausea and vomiting. Perforated ulcer 1941	7		2-28-47
22	53	Pain, nausea, vomiting	6	Total — 67° Free — 50°	3-4-47
23	68	Pain, weight loss. Two massive hemorrhages	2		3-13-47
24	23	Pain. Nausea and vomiting episodes. Previous perforated ulcer	5	Total — 38° Free — 18°	3-14-47
25	47	Pain, nausea and vomiting. Perforated ulcer eight years ago	10		4-1-47
26	52	Fullness in throat. Coughing blood. Weakness for one year	5		4-2-47
27	50	Pain. Weight loss	5		4-4-47
28	57	Pain. Nausea and vomiting	1		4-7-47
29	51	Epigastric pain, vomiting and diarrhea	7	Total — 50° Free — 22°	4-22-47
30	44	Pain. Nausea. Flatulence	4		4-29-47
31	53	Gastric enterostomy 1929. Pain, nausea, vomiting, hematemesis, tarry stools	19	Total — 25° Free — 15°	5-1-47
32	60	Gastroenterostomy 1921. Epigastric pain. Repeated gastrointestinal hemorrhages	35		5-2-47

TABLE 2 (*continued*)

POSTOPERATIVE COMPLICATIONS	X-RAY FINDINGS	PATHOLOGIC DIAGNOSIS
	Scarring due to duodenal ulcer	Scar tissue and chronic inflammation, localized first portion, duodenum
	Massive hematemesis prevented gastrointestinal study	Chronic duodenal ulcer
	Duodenal ulcer with scarring	Penetrating duodenal ulcer
	Pyloric obstruction due to duodenal ulcer	Chronic duodenal ulcer
Right lower lobe atelectasis Bronchopneumonia	Duodenal ulcer, active	Ulcer, chronic, with constriction of pylorus. Aberrant pancreatic tissue. Lymphadenitis, chronic
	Irregular duodenal cap with clover-leaf deformity	Duodenal ulcer, chronic, healed
	Diverticulum of duodenum	Duodenal ulcer. Diverticulum of duodenum
	No x-ray due to massive hemorrhage	Kissing duodenal ulcer. Stomach, adenocarcinoma
	Markedly dilated duodenal cap, questionable prepyloric pathology	Gastritis and duodenitis, hemorrhagic, mild
	Duodenal ulcer	Duodenal ulcer, chronic
	Deformity duodenum	Duodenal ulcer, chronic
None immediately. Readmitted 5/22/47 with recurrent ulcer duodenal stump. Died 7/30/47 after repeated hemorrhages	Irregular duodenal cap	Duodenitis, chronic. Hemorrhagic polyp, duodenal, with ulceration
Transient jaundice, slight	Dilated stomach	Duodenitis, chronic, with ulceration
Hyperpyrexia, etiology undetermined	Ulcer niche, pyloric obstruction	Duodenitis, chronic
	Deformity of duodenum with obstruction	Chronic duodenal ulcer
	Duodenal diverticulum and irregularity	Duodenal ulcer, perforating posterior wall. Duodenitis, chronic, anterior wall
	No x-rays taken due to massive hemorrhage-emergency	Ulcer, duodenal, chronic
	Possible duodenal ulcer	Duodenal scarring
	Normal duodenum	Scarred area first part of duodenum
	Duodenal ulcer with crater	Duodenal ulcers, chronic. Perforating
	Duodenal cap not visualized	Duodenal ulcer, chronic, penetrating
	Possible prepyloric pathology	Duodenal ulcer, old, healed
	Irregularity of duodenal cap	Chronic duodenal ulcer
	Duodenal ulcer	Chronic duodenal ulcer. Traction diverticulum of stomach
Atelectasis first postoperative day	Duodenal cap does not appear normal	Duodenal ulcer
	Duodenal ulcer	Duodenitis, chronic
	Irritable duodenal cap	Duodenal ulcer
Abscess right upper quadrant. Obstructive jaundice. Atelectasis	Pyloric obstruction	Duodenal ulcer. Chronic cholecystitis. Cholelithiasis
	Penetrating ulcer, lesser curvature	Ulcer, duodenal, small, healing. Ulcer, gastric, active. Lymphadenosis. Jejunum with aberrant pancreas
Atelectasis first postoperative day	Duodenal ulcer. Duodenal diverticulum	Chronic duodenal ulcer. Chronic duodenitis. Duodenal diverticulum. Ectopic pancreas tissue of stomach
	Nonfunctioning gastroenterostomy. Obstruction, adhesions, third part duodenum	Jejunal ulcer, marginal
5/12/47—Cerebral hemorrhage, right	Deformity of first portion of duodenum	Ulcer, duodenal, active. Ulcer, gastrojejunal, healing. Duodenal diverticulum

TABLE 2 *(continued)*

SUMMARY OF CASES OF DUODENAL ULCER TREATED BY PARTIAL GASTRECTOMY

CASE	AGE (YEARS)	CHIEF SYMPTOMS	DURATION OF SYMPTOMS (YEARS)	PREOPERATIVE FASTING GASTRIC ACIDITY	DATE OF OPERATION
33	53	Epigastric pain, nausea and vomiting	25	Total — 18° Free — 0°	5-7-47
34	26	Pain, nausea and vomiting. Weight loss.	4		5-12-47
35	45	Pain. Nausea and vomiting	4		5-14-47
36	34	Ruptured ulcer 1944. Epigastric pain, nausea, vomiting, tarry stools	3	Total — 50° Free — 34°	5-28-47
37	23	Pain, nausea, two massive hemorrhages	2		6-3-47
38	56	Pain, nausea and vomiting	20	Total — 33° Free — 16?	6-4-47
39	32	Pain. Five episodes of hemorrhage	5	Total — 100° Free — 8?°	6-6-47
40	47	Pain. Night pain. Food dyscrasias	10	Total — 11° Free — 0°	6-9-47
41	65	Pain. Nausea, vomiting, flatulence	6	Total — 66° Free — 48°	6-13-47
42	51	Pain, nausea, weight loss. Gastroenterostomy seven years ago	12	Total — 64° Free — 38°	6-18-47
43	38	Pain, nausea, hematemesis, tarry stools	3		6-27-47
44	30	Pain. Massive hemorrhage	3		6-28-47
45	31	Epigastric pain, nausea and vomiting	7		7-3-47
46	40	One massive hemorrhage. Weight loss, pain and vomiting	20	Total — 22° Free — 0°	8-8-47
47	54	Pain. Two episodes of ruptured ulcer (9 and 15 years ago). Vomiting, weight loss	17	Total — 60° Free — 50°	11-10-47
48	40	Epigastric pain, hematemesis, tarry stools	12		12-16-47
49	59	Pain, nausea. One episode of hemorrhage	17	Total — 70° Free — 60°	2-25-48
50	31	Pain. Night pain, vomiting	6	Total — 55° Free — 8°	3-25-48
51	51	Pain. Nausea	4	Total — 22° Free — 0°	4-14-48
52	46	Epigastric distress. Nausea, vomiting	14	Total — 77° Free — 52°	5-11-48
53	28	Pain, nausea. Perforated ulcer 1946	6	Total — 45° Free — 26°	5-18-48
54	32	Pain, nausea and vomiting. One massive hemorrhage	3	Total — 23° Free — 0°	5-24-48
55	56	Epigastric pain, vomiting, tarry stools, flatulence	25	Total — 25° Free — 12°	6-9-48
56	41	Pain, nausea, vomiting. Tarry stools	6	Total — 10° Free — 0°	6-24-48
57	29	Pain. Hematemesis, weight loss	6	Total — 36° Free — 20°	7-13-48
58	46	Pain, nausea, vomiting, tarry stools	14	Total — 15° Free — 0°	8-2-48
59	58	Epigastric pain, nausea, rectal bleeding	2	Total — 69° Free — 40°	8-3-48
60	58	Ruptured ulcer 1928. Epigastric pain, tarry stools, vomiting	20	Total — 40° Free — 0°	8-4-48
61	32	Epigastric pain. Vomiting, 10 lb. weight loss	9	Total — 85° Free — 40°	9-3-48
62	51	Hematemesis, epigastric distress, flatulence, nausea, vomiting	17	Total — 38° Free — 23°	9-8-48
63	60	Epigastric pain. Nausea, vomiting	5	Total — 43° Free — 10°	9-29-48

TABLE 2 *(continued)*

POSTOPERATIVE COMPLICATIONS	X-RAY FINDINGS	PATHOLOGIC DIAGNOSIS
	Negative	Chronic duodenal ulcer
Pulmonary thrombosis. Peritonitis	Duodenal ulcer	Duodenal ulcer, chronic. Duodenitis, chronic
	Duodenal ulcer	Chronic duodenal ulcer. Congenital cyst of liver
	Duodenal ulcer (clover leaf)	Duodenal ulcer, chronic
	None taken because of severe hemorrhages	Gastroduodenitis, subacute. Lmyphadenitis
Atelectasis second postoperative day	Obstructive lesion of pylorus	Ulcer, healing, duodenal. Pyloric stenosis
	Duodenal ulcer, active	Ulcers duodenal, healed. Duodenitis, chronic
	Duodenal ulcer	Chronic duodenal ulcer
Obstruction efferent loop. Postoperative enteroenterostomy between afferent and efferent loop	Deformity duodenum	Gastritis and duodenitis with mucosal ulcerations, multiple
	Irritable, deformed duodenum	Ulcers, two, marginal, chronic lymphadenosis
Second postoperative day bilateral pneumonia	Duodenal ulcer, active	Ulcer, duodenal, chronic
Phlebothrombosis tenth postoperative day	No x-rays. Emergency gastric resection	Duodenal ulcer, subacute
	Duodenal ulcer, active	Ulcer, duodenum, healing
	Duodenal ulcer with scarring	Chronic duodenal ulcer
Abdominal distention for six days	Duodenal ulcer	Duodenal ulcer, subacute. Diverticulum of duodenum, traction type
	Not done	Duodenitis chronic, with ulceration
	Irritable duodenum with prepyloric lesion and gastric retention	Ulcer, duodenal, chronic
	Stenosing duodenal ulcer	Duodenal ulcer, chronic
Shock five hours after surgery. Responded to therapy	Deformed duodenal bulb	Duodenal ulcer. Fecalith of appendix
	Stenosing, duodenal ulcer	Duodenal ulcer, chronic
	Scarred duodenal bulb	Duodenal ulcer, chronic. Duodenal diverticulum
	Stenosing duodenal ulcer	Duodenal ulcer, chronic
Hematoma, small, of wound	Stenosing duodenal ulcer	Duodenal ulcer, chronic
	Obstructive lesion at outlet of stomach	Duodenal ulcer, chronic
	Duodenal ulcer	Duodenal ulcer, chronic
	Scarred bulb, old duodenal ulcer	Ulcer, duodenal. Ulcer, gastric
	Scarred duodenum	Duodenal ulcer, chronic
Abdominal abscess. Drained fifteenth postoperative day. Recovery uneventful	Prepyloric niche and obstruction	Gastric ulcers and duodenal ulcer
Atelectasis, left base	Atonic stomach, 40 per cent retention, probably due to scarred duodenal ulcer	Duodenal ulcers. Pyloric stenosis
Seventh postoperative day thrombophlebitis, right foot	Obstructive lesion, outlet of stomach	Hyperplasia, omental lymph nodes. Ulcer pyloric area stomach
	Stenosing lesion, outlet stomach	Duodenal ulcer, chronic

TABLE 3
RESULTS OF FOLLOW-UP STUDY

WEIGHT GAIN	
Yes	27
No	9
No change	12
ABDOMINAL PAIN AS BEFORE SURGERY	
Yes	3
No	46
No change	1
APPETITE	
Excellent to good	33
Fair	11
Poor	5
NAUSEA AND VOMITING	
None	33
Occasionally	11
Periodically	3
Frequently	2
DIET	
Ulcer diet	28
Nonrestricted diet	21
BOWEL HABITS	
Normal	39
Constipated	0
Diarrhea	2
Changing habits (diarrhea-constipation)	8
ABLE TO EARN LIVELIHOOD BEFORE SURGERY	
Yes	20
No	22
Part	7
ABLE TO EARN LIVELIHOOD AFTER SURGERY	
Yes	21
No	19
Part	9

right-angle Lembert stitch, following which interrupted sutures are placed as a third row both anteriorly and posteriorly. The efferent and afferent jejunal limbs of the anastomosis are then anchored to the gastrocolic and gastrohepatic ligaments respectively, and the abdomen is closed in layers with interrupted silk sutures.

POSTOPERATIVE MANAGEMENT

Postoperatively, it has been our policy to employ continuous Wangensteen suction for two postoperative days or until peristalsis is present, following which the tube is removed and hourly oral feedings of water are begun. Feedings are gradually increased in amount and variety and decreased in frequency until at the end of the first postoperative week the patient receives a diet similar to the Harris diet, divided into 6 daily feedings. The patient is usually ambulated on the first or second postoperative day.

Intravenous fluids, antibiotics, sulfonamides, and blood transfusions are given as indicated, and, although a basic routine has been established, it is again emphasized that the treatment is individualized rather than ritualistic. We have had no postoperative wound disruptions and no incisional hernias using the above described transverse incision.

The patients are advised to eat 6 meals a day for a period of approximately six months following their discharge. They are not placed on a diet, but are advised to stop smoking, although in our experience this advice has been usually disregarded.

RESULTS

We are reporting a series of 63 proved cases of duodenal ulcers which were resected on our surgical service from August 1946 to September 1948. These cases are summarized and listed in Table 2. All of these cases had adequate trials on medical management before surgical intervention was attempted. Of the 63 resected cases, 20 (32 per cent) had histories of at least one massive hemorrhage; 14 (22 per cent) had histories of at least one perforation, and 3 (4.7 per cent) had previous gastroenterostomies. This gives a total of 37 cases (59 per cent) who had some complication of duodenal ulcer prior to partial gastrectomy.

The sex incidence of this series is necessarily limited to males, since this hospital treats primarily male veterans.

The ages of the patients varied from 21 to 65 years; the average age was 45.3 years.

The duration of symptoms prior to surgery averaged 10.1 years, the longest period being 35 years, and the shortest 1 year.

We have had follow-up studies on 49 patients or 78 per cent of the cases over this period. The results as to weight gain, abdominal pain, appetite, nausea and vomiting, diet, bowel habits, and economic rehabilitation, are shown in Table 3.

A word of explanation might be in order in interpreting the figures on economic rehabilitation. An appreciable number of these patients are day laborers and have been receiving partial disability pensions for many years, and therefore desire to continue to live on a limited income.

TABLE 4

POSTOPERATIVE COMPLICATIONS

TYPE OF COMPLICATION	NUMBER
Abscess, right upper quadrant**	2
Atelectasis	6
Bronchopneumonia	1
Cerebral hemorrhage	1
Hematoma, wound	1
Jaundice, transient**	2
Obstruction, efferent loop, jejunum	1
Peritonitis, generalized*	1
Pneumonia	1
Pulmonary thrombosis*	1
Thrombophlebitis, leg and foot	2
TOTAL	19

*Occurred in patient that died.
**Occurred in same patient.

Fifty-five per cent of cases showed a gain in weight and 24 per cent showed no change. Ninety-four per cent of cases were relieved of their ulcer pain and 89 per cent showed definite improvement in appetite. Forty-three per cent were free from any dietary restrictions and 57 per cent were following a modified diet. Seventy per cent were free from nausea and vomiting whereas 29 per cent complained of occasional gastric upsets, particularly if they overate.

There were 3 deaths in the series; one occurred on the sixth postoperative day and was due to pulmonary thrombosis; one occurred seven months postoperatively and was due to recurrent ulcer in the duodenal stump, pancreatic necrosis, and hemorrhage from the superior pancreaticoduodenal artery. Both cases were autopsied and the diagnoses were confirmed. The second case presented a difficult problem as to management. At the time of reoperation because of massive gastrointestinal hemorrhage, a small ulcer was found in the duodenal stump with erosion into the head of the pancreas and with pancreatic necrosis. Resection of the ulcer and necrotic pancreatic tissue was followed in ten days by massive hemorrhage and additional pancreatic digestion. Repeated attempts to control hemorrhage by surgery over a period of a month was futile because of pancreatic digestion of the wound with a resultant hemorrhage.

The third death occurred seven months after surgery and was due to delayed rupture of the duodenal stump, generalized peritonitis, and subphrenic abscess.

The operative mortality was 1.6 per cent. The mortality from late complications secondary to surgery was 3.2 per cent.

The postoperative complications in the series of patients are listed in Table 4. Twenty-seven per cent of the patients developed postoperative complications from which all except 1 recovered.

TABLE 5

ASSOCIATED OPERATIONS

OPERATIONS	CASES
Appendectomy	2
Cholecystectomy	1
Cholecystojejunostomy	1
Cholecystotomy with removal of calculi	1
Excision, marginal ulcer and resection of gastroenterostomy	2
Meckel's diverticulectomy	1
Ventral hernioplasty	1
TOTAL	9

Operations performed in conjunction with partial gastrectomy are listed in Table 5. These 9 cases represent 14.3 per cent of the entire series who required additional surgical procedures to remove associated pathology.

DISCUSSION

In the general review and appraisal of the results of this series, definite improvement and relief of the symptom-complex of peptic ulcer syndrome occurred in 84 per cent of the cases. The remaining 16 per cent had a variety of complaints such as occasional nausea and vomiting, failure to gain weight, dietary restrictions, and in a few cases epigastric pain similar to the type which occurred prior to surgery. These features have been reported in other series in about the same percentages where the operative procedure was similar or in which the anastomosis was retrocolic.

The employment of an antecolic, short, jejunal loop about 4 inches in length has posed no problem in surgical technic and has not resulted in obstruction of the transverse colon or of the jejunal stoma at either limb of the anastomosis. The above policy was instituted to minimize the incidence of marginal ulcer. Since the reports of Wangensteen and others have shown that the jejunal mucosa is less resistant to the effects of the gastric juices than the duodenum and that this resistance becomes proportionately less in the segment of jejunum several inches beyond the ligament of Treitz, the shorter the afferent limb of jejunum is the less chance of a stomal ulcer developing, provided the gastric resection is adequate. The incidence of marginal stomal ulcers has been reported as high as 8 per cent in some series. Up to the present time there has been no evi-

dence of marginal ulcer in this series or in a previous series of one of the authors (L.T.P.) in which an antecolic anastomosis with a longer afferent jejunal loop was used.

The performance of this type of anastomosis is more simple, less dangerous, and requires less time than a retrocolic anastomosis. In the event that further gastric surgery becomes necessary, it is much easier to take down an antecolic than a retrocolic type of anastomosis.

The postoperative gastric analysis obtained in many of the cases has shown a marked decrease in the total acidity and in many instances a complete absence of free acid in the fasting specimen. This appears to indicate that the gastric resection has been adequate.

As pointed out elsewhere in this paper all of the duodenal ulcers were removed. This policy presents a difficult problem in surgical technic and is wrought with great danger of injury to important structures in this vital area. The removal of the chronic ulcer obviates the complications that may arise in a certain percentage of cases. In some of the reported series, when the ulcer is left in situ, the incidence of recurrent ulcer syndrome, repeated hemorrhages, and perforation has been high.

The large stoma between the transected portion of the stomach and the jejunum has not been too troublesome in this series of cases. Only 2 cases had complaints which may be classified as the "dumping syndrome." Both cases were relieved by rest and eating small quantities of food. The symptoms persisted only for a few months.

A continuation of the technic of using the entire cut end of the stomach for the anastomosis seems warranted since it simplifies and shortens the operating time. The closure and inverting of a portion of the transected stomach to reduce the size of the stoma introduces a hazard of the inverted cuff which may cause obstruction at the anastomotic limb of the jejunum and stomach.

In a few instances patients complained of gastric upsets shortly after surgery. These most likely were a result of bile gastritis. Under proper dietary regimens these symptoms disappeared after a few weeks.

SUMMARY AND CONCLUSIONS

1. Sixty-three cases of duodenal ulcer treated by partial gastrectomy are presented.

2. In all cases the ulcer was removed and the anastomosis was of the antecolic type using a short, afferent, jejunal loop.

3. The operative mortality was 1.6 per cent.

4. The overall results are considered excellent to good in 84 per cent of the cases.

5. There have been no cases of postoperative marginal or stomal ulcers in our follow-up series at the time of this report.

6. The most frequent postoperative complication was atelectasis which occurred in 9.6 per cent of the cases.

7. Early ambulation of patients reduced the morbidity rate and hastened the postoperative convalescence.

8. There were no cases of wound disruption or postoperative hernia with the use of a supraumbilical, transverse, elliptical incision.

9. The end results of this antecolic anastomosis are comparable to the results reported in the retrocolic anastomosis series.

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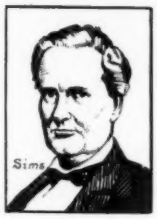

Hysterosalpingography

ITS DANGERS AND THEIR PREVENTION

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Since its inception in 1912 hysterosalpingography has become an important diagnostic aid in the field of gynecology and particularly in the study of sterility. The worldwide use of this procedure testifies to its values but may lead one into a false sense of security in its employment.

The fact that the introduction of opaque media into the uterus and tubes for x-ray studies is accompanied with danger is amply illustrated by even fatal accidents reported.[1] The vast majority of these deaths have been caused by emboli. These fatalities, when accumulated and added to the undoubtedly numerous unreported cases of death from this procedure, cause us to wonder if a true understanding of its dangers is had by many of the thousands who use it. There is also abundant evidence[2-4] to indicate that dangers of a nonfatal type exist in a greater degree than seems generally understood; these primarily are (1) incapacity from nonfatal pulmonary or other emboli; (2) introduction or spreading of infection in the tubes, and (3) local tissue reaction to the opaque medium.

It is our purpose to evaluate hysterosalpingography in relation to its value as compared with its dangers and to discuss some of the means by which such dangers can be avoided.

The first step in avoiding dangerous complications is to reduce the incidence of performance of hysterosalpingography by recognizing that it is an elective, not a routine, procedure to be done only on actual indications, not in competition with tubal insufflation. It should be restricted to cases with evidence of tubal obstruction previously demonstrated by tubal insufflation, or to aid in the diagnosis of suspended small intrauterine polyps or other tumors in connection with sterility studies. Occasional other indications are cited below. It is altogether dangerous enough not to be used as a routine substitute for tubal insufflation.

The second essential precaution is to avoid damage to the integrity of the tissues by preliminary dilatation of the cervix, curettage, or by any other than the most cautious use of screw-threaded cannula tips. Smooth metal or rubber tips are definitely preferable. Undue force or pressure in introducing the opaque medium into an undamaged uterus may be similarly dangerous. Blood vessels can be forced open and obstructed tubes ruptured, and to disregard a patient's complaint of excessive pain is to be callous and indifferent to such dangers. This is only one of the reasons why an anesthetic agent should not be used either for hysterosalpingography or for simple insufflations.

The third essential precaution to reduce the incidence of accidents is to use radiopaque media which irritate to the least possible degree, and are not retained as unabsorbable foreign bodies after their injection.

During the thirty-eight years that hysterosalpingography has been utilized many radiopaque substances have been tried in a search for the ideal medium. Sodium iodide, sodium bromide, strontium iodide, bromide oil, and many others, with a few exceptions, proved too irritating and occasionally toxic to a degree causing death. In 1925 Carlos Heuser of South America made a

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favorable report on the use of iodized poppyseed oil, commercially named lipiodol, as a radiopaque medium to visualize the tubes. This report stimulated many others to use this medium and it was generally agreed that iodized oil was more radioresistant than any other medium previously investigated. Presently reports began to appear claiming value for hysterosalpingograms not only in determining tubal patency or nonpatency but also as a diagnostic aid for (1) small intracavitary myomas; (2) polypoid hyperplasia of endometrium; (3) appraisal of uterine cavity dimensions after myomectomy; (4) studying morphology in congenital anomalies; (5) diagnosis of tuberculous salpingitis, and (6) even as a diagnosis of pregnancy.[6] Tissue reaction, peritoneal irritation, or oil emboli were not mentioned in these pages.

Iodized oil was so enthusiastically received that Campbell in 1932 said, "One cannot escape the conclusions that this preparation which is so impermeable to x-ray, is nonirritating and nontoxic and it can be administered with a minimum amount of discomfort and danger to the patient."

To discredit the important role that has been played by iodized oil in developing our knowledge of uterotubal functions and in the diagnosis of many pathologic conditions would be unfair. Indeed it has been the "work horse" around which much knowledge has been accumulated. But after its use in many thousands of cases, reports of unfavorable reactions and complications began to appear in the literature. These in their more severe form were oil embolism, peritonitis, and less grave but still serious complications such as acute salpingitis, chills, fever, jaundice, pelvic abscess, encapsulation of iodized oil with foreign body reaction, and caseous degeneration of the tubes. Ample evidence was presented showing that oil remains in the pelvis for years. It may be eventually absorbed, though much too slowly. The iodine apparently disappears first as indicated by several observers who found globules of iodine-free oil in the pelvis a year or more after injection. It is believed that the oil is gradually broken down into fatty acid and is then slowly absorbed.[4]

The tissue reaction that occurs from iodized oil varies from none to severe sudden inflammatory reaction. Rabbiner[7] mentions a case of fulminating peritonitis with death of the patient twenty-four hours after injection. This was in all probability due to a bacterial invasion but it is often difficult to determine whether immediate reaction is due to infection or extreme sensitivity to the medium. We know that iodized oil has little or no bactericidal action.

Reichle and Rottger[8] reported 19 cases in which they believed injury followed the injections of iodized oil. Four patients developed granulomatous inflammation of the tubes with irreparable damage while the others developed a peculiar type of tubal inflammation characterized by oil deposits. They consider this inflammatory process more likely to occur in cases of tubal occlusion where the oil is held in the tubes over a long period of time.

Schultze[9] reported 200 laparotomies done from one to sixty days after salpingography. In every case he found a residue of the oil in the form of a film over the pelvic peritoneum and in the folds of the abdominal peritoneum. There were no adhesions, but in 7 cases there were yellowish plaques with evidence of fresh tissue changes on the posterior surface of the uterus, broad ligament, and in folds of the abdominal peritoneum.

Lash[10] performed a laparotomy on a patient twenty-two months after salpingography and found dense adhesions from the omentum to the parietal peritoneum and to the pelvic organs. There were several cystic masses containing a clear, amber, oily fluid and foreign body giant cells were present. It was interesting to note that a successful pregnancy had occurred in the interim between the salpingography and the laparotomy.

Oil trapped in an occluded tube is retained almost indefinitely and often dooms the tube to permanent occlusion. Rubin[11] mentions the artificial production of tubal occlusion through the inflammatory reaction to iodized oil.

There are many other reports of tissue reaction to iodized oil, most of which mention dense adhesions and foreign body reaction after a long interval of time had elapsed between salpingography and laparotomy. In general, it seems that tissue reaction to iodized oil is a very slow process—the foreign body reaction developing slowly after many weeks of oil retention. In the majority of the reports in the literature the severity of the foreign body reaction was proportionate to the time between salpingography and examinations at laparotomy or autopsy. It

FIGURE 1. Venogram of uterus and right ovarian vein after accidental intravasation with skiodan acacia.

would seem, therefore, that the slowness with which tissue reaction to iodized oil occurs and the fact that the reactions seldom produce symptoms, offer an explanation of the early beliefs that the substance is nontoxic.

THERE are several reports[12,13] in the literature claiming that iodized oil has real therapeutic value in relieving tubal occlusion; one states that 71 per cent were "cured" by injecting oil. The average number of injections was 2.8 per patient with 63 per cent becoming pregnant after an average of 4.7 months. These are outstanding results but our experiences do not even suggest that this procedure enjoys such specific therapeutic effect. Any heavy medium injected into obstructed but partially patent tubes may stretch and open them so that this is probably no mysterious therapeutic virtue.

While there are many observers who have had cases in which iodized oil was intravasated into the venous system and caused only mild symptoms there are enough who have had fatalities result from oil emboli to cause concern over this risk from such a nonabsorbable medium. Symptoms from intravasated oil may be negligible, or they may be mild pain in the chest, coughing of blood-stained sputum, chills, fever, or shock. Occasionally there is sudden death. X-ray will often show a pulmonary angiogram; the shadow disappears in three to four days associated with heavy albuminuria and hematuria. In the majority of cases where oil emboli have occurred the injections have been made within five days after the cessation of the menstrual flow while vessels are still open. This, of course, is bad timing, but intravasation has occurred at all stages of the menstrual cycle.

Following an accident in 1937 in which a patient of one of us (P.T.) developed an acutely inflamed pelvic mass following hysterosalpingography with iodized oil, he and his colleagues started on a course of investigation which led to the development of a nonoily radiopaque medium with a viscosity deliberately made identical with that of lipiodol at body temperature. It is *skiodan* (iodomethanesulfonate) made appropriately viscid by the addition of acacia. Extensive tests at that time showed skiodan acacia to be nonirritating and rapidly absorbed. X-ray shows that this medium disappears from view after less than one hour. The skiodan is excreted by the kidneys and the acacia by the liver and intestinal tract, all trace of them having disappeared after seventy-two hours.

Skiodan acacia solution is prepared commercially in 10 cc. vials and after ten years of its use

there has not to our knowledge been a single fatality or serious accident reported. Colleagues have told us of exceptional instances where patients became suddenly faint on the table and these may have been emboli though not fatal. We assert that it is logical to expect less serious damage when this does occur with a rapidly absorbed medium than with a nonabsorbable one. Moreover, acacia solution has been deliberately employed in the past for intravenous injection for shock with no thought of emboli, so we even doubt its possible action in such a respect.

One of our group (C.N.P.) recently, while injecting skiodan acacia solution, noticed a sudden lack of resistance to the injection of the third 3 1/3 cc. All of our group use the fractional or serial injection technic described by Hyams. The x-ray taken after this injection showed a venogram of the entire uterus and of the right ovarian vein. Twenty minutes later, after seeing this picture, another x-ray film was exposed and this showed no skiodan in the uterus or veins and only a residue in a clubbed tube. The patient developed a transitory urticaria which disappeared in a few minutes, no further ill effects being noted. Urticaria, usually mild, has been the outstanding ill after effect thus far reported, and is probably due to occasional sensitivity to acacia (Figure 1).

Skiodan acacia solution has been found to have all the advantages of iodized oil without the danger of oil emboli or tissue reaction. We now believe that iodized oil has no place in the field of hysterosalpingography. Subsequently, in 1941, Rubin[11] developed another radiopaque medium, named viscorayopaque, with properties similar to skiodan acacia solution. It has one notable disadvantage, however, in being irritating to the peritoneum and causing considerable discomfort and pain when it spills from the tubes into the peritoneal cavity, presumably from the alcohol which it contains.

Faulty technic of hysterosalpingography can result in dangers to the patient. The most common error is made in performing the test too soon after the menstrual flow or after curettage. At least five days, preferably seven, should elapse after the last day of the menstrual flow before injection of any opaque medium. After curettage it is wise to wait until after the next regular menstrual period before attempting the test and dangerous not to wait. Disregard for these safety factors exposes the patient to unnecessary risks. One recent report tells of pulmonary oil embolism, as verified by x-ray following the injection of iodized oil. Six days later the injection was repeated with the same results! The patient was indeed fortunate in not suffering any more serious effects.

It may be coincidence but several cases of venous intravasation of the opaque medium have come to our attention when the metal cannulas with threads designed to be screwed securely into the cervix were employed. It seems probable that venous sinuses are more likely to be opened by it than by some of the other types. Another such cannula with a removable handle has been devised so that the patient can be injected, obviously with a nonabsorbable medium, and then arise from the table and walk to the x-ray department. A stopcock prevents the medium from running out. It would seem simpler and safer to take the patient to a cystoscopic table, with x-ray attachments, for the injection.

We usually employ the metal cannula with a rubber cone shaped acorn held tightly against the external os and have been satisfied with its function. We are attracted by a rubber cannula described by Decker[15] which has a small balloon to be inflated in the cervical canal but we have had no experience with this cannula. Briefly the technic we have found most satisfactory is as follows:

The patient is placed in the lithotomy position on a cystoscopic table with x-ray attachments. The cervix is painted with an antiseptic and is grasped by a tenaculum. This is used for counter traction as the cannula is inserted into the cervix with the rubber acorn held tightly against the external os (the special cannula devised by Jarcho is recommended). A scout plate of the abdomen is made; 3 1/3 cc. of skiodan acacia solution are injected followed by film exposure; 3 1/3 cc. more are injected with film exposure, followed by a final injection of 3 1/3 cc. to a total of 10 cc. for the last film exposure. Two stereoscopic films may be substituted for the last single one, if desired. This gives a series of pictures from which adequate studies can be made.

If at any time during the injection of the opaque medium the patient complains of undue pain the injections are stopped. This subjective sensation of the patient is an important warning signal against the use of too much pressure.

This is one reason we object, as mentioned before, to the use of anesthesias as employed by some and have not found need for a pressure manometer.

SUMMARY

1. The incidence of hysterosalpingography should be reduced. It should be performed only on actual indications and not in competition with tubal insufflation.

2. The dangers of hysterosalingography are (1) tissue reaction to the medium, (2) introduction or spreading of infection, and (3) embolism.

3. Nonabsorbable oil-based media should not be used. Skiodan acacia is the medium of choice because it is rapidly absorbed and eliminated.

4. The dangers of faulty timing and technic are discussed.

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McDOWELL'S OVARIOTOMY OF 1809

Some authorities have said that Dr. Ephraim McDowell (1771-1830) of Danville, Kentucky, was the first surgeon in America to remove successfully a large ovarian tumor. This he did on Christmas Day, 1809, for Mrs. Thomas Crawford.

Anesthesia at that time was not available. The scene reproduced above was re-enacted in 1933 by members of the Salerno Club of the Mayo Clinic, Rochester, Minnesota. (Reproduced by courtesy of the Mayo Foundation Museum of Hygiene and Medicine.)

Diagnostic Clinic

Diverticulitis of the Colon

CHARLES W. MAYO*

MAYO CLINIC, ROCHESTER

I AM to talk today on diverticulitis. First, however, I would like to say a few words about diverticulosis, because practically one out of every ten of you, or a little less than 10 per cent of those present who are more than 50 years of age have diverticulosis.

I have concluded from taking histories of various people with this condition, that there is a hereditary factor in connection with it. I have seen an interesting example of this, a mother, her sister, her brother and two sons, all of whom not only had diverticulosis but had had diverticulitis as well.

When the diagnosis of diverticulosis is made on the evidence given by a roentgenogram of the colon, what should the patient be advised to do? One certainly does not want to scare the patient, and yet each one of us should think of certain important features when we meet that situation.

A good many of these patients are constipated, and I think they should be told to keep their stools soft, perhaps with a little mineral oil, milk of magnesia, or something else of that nature of a mild type. They should be told to avoid nuts, fruits, and foods with seeds in them, as much as possible, and particularly should avoid heavy, strong laxatives, cathartics, and purges, because each one of the little outpouchings is the potential seat of diverticulitis.

I have found also that a good many of these patients (it does not hold true in 100 per cent) have been obese at some period in their lives. When they consult a physician they may be thin, but it is important to advise persons who have diverticulosis that they stay on the thin side rather than on the obese side.

Most patients with diverticulitis can be treated satisfactorily medically. Before I go into that further I would like to present the first case.

This very nice lady has consented to come up this afternoon. She gives a history of having come for examination in June. At that time she weighed 122 pounds and was not having much difficulty except for chronic constipation. She came to the Presbyterian Hospital the middle of September with acute pain in the right lower quadrant of the abdomen and a tender mass. She was operated on the same day that she arrived at the hospital. At the time of operation she was found to have acute appendicitis with a peri-appendiceal abscess. The appendix was removed, and drainage was instituted. A few weeks later she had a roentgenologic examination of the colon. In this roentgenogram evidence of diverticulosis and diverticulitis was found. She has been handled very satisfactorily from a medical standpoint. In spite of her appearance (and I told her she looks younger) she will be 74 years old in December.

The older a person gets the more risk there is in connection with diverticulosis and diverticulitis. This patient wanted to know whether it was very serious, and I told her that in her particular situation it was not going to be if she takes proper care of herself.

In Table 1, I have listed the measures which I consider to constitute, from the medical stand-

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Presented November 2, 1949, before the meeting of the Interstate Postgraduate Medical Association of North America, Philadelphia, Pennsylvania.

point, the proper treatment. Rest and sedation are of primary importance, once diverticulitis develops. So often these patients will not consult a physician until they have tried to treat themselves at home with one thing and another for several days.

I believe that the deep diathermy, at least in the cases with which I have had to deal, has been of great benefit.

The antibiotics and sulfasuxidine and sulfathalidine may be useful.

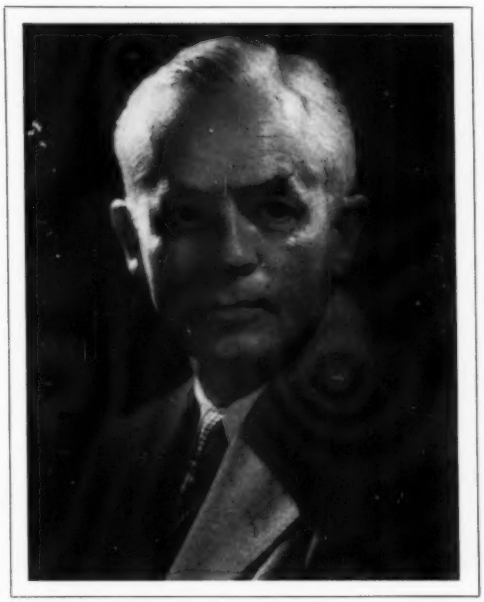
TABLE 1

MEDICAL TREATMENT OF DIVERTICULITIS

Early diagnosis and prompt medical treatment minimize surgical intervention for most patients.
1. Rest and sedation
2. Deep diathermy and hot stupes
3. Antibiotics
4. Fluids by mouth, vein or both

Lately we have been using a bit of aureomycin given in gelatin. I think these patients can have about the same dosage that one would employ in preparation of the colon for surgery or a little less; that is, at least 500 mg. of aureomycin once every six hours (three of the doses with the meals). I believe also that in addition to this, in order to kill off the protei and the yeasts, that streptomycin should be given. I suggest that streptomycin be given along with the aureomycin over a period of perhaps seven days; 2 gm. of streptomycin a day in doses of 0.5 gm. is a good plan. At the end of about four days under this regimen the stools are practically odorless and one cannot, at least from our research work, grow anything from these stools.

Fluids rather than anything solid should be given by mouth. Avoid foods which the patient should not have and which do not agree with the patient. I think a liquid diet is called for.



CHARLES W. MAYO

IN trying to prepare what I have to say to you we went over the cases encountered at the Mayo Clinic in a ten-year period, from 1948 back for ten years, and these cases of which I am going to speak in trying to clarify the situation a bit are a series of 202 patients each of whom had resection for proved diverticulitis.

In Figure 1 you will see that none of the 202 patients had diverticulitis of the rectum, that 198 had diverticulitis of the sigmoid, only 1 had it in the descending colon, 1 in the transverse colon, and 2 in the cecum. Of the 202 patients, the oldest was 80 years of age, the youngest 26, and the average age was 54. This range of ages is the same as that of patients who have carcinoma.

As to sex, the males take the predominance; there were 2 males to 1 female.

TABLE 2

SYMPTOMS IN 202 CASES OF DIVERTICULITIS, 1939-1948

SYMPTOMS FROM:	
Obstruction	1/2 of cases
Fistulas	1/3 of cases
Abscess	1/4 of cases
Melena	8 per cent of cases
Average duration	2 yr. and 10 mo.

When one reviews this question from the standpoint of symptoms, one finds as shown in Table 2 that obstruction causes the symptoms of half or a little more than half of the patients with diverticulitis. Fistulas were found in a little more than a third of the patients. Abscess was found in a little more than a quarter of the patients, and melena was found in a little over 8 per cent; the last incidence is low in comparison to the incidence in cases of malignancy. In such cases melena, bleeding on defecation, or blood-streaked stools may be found.

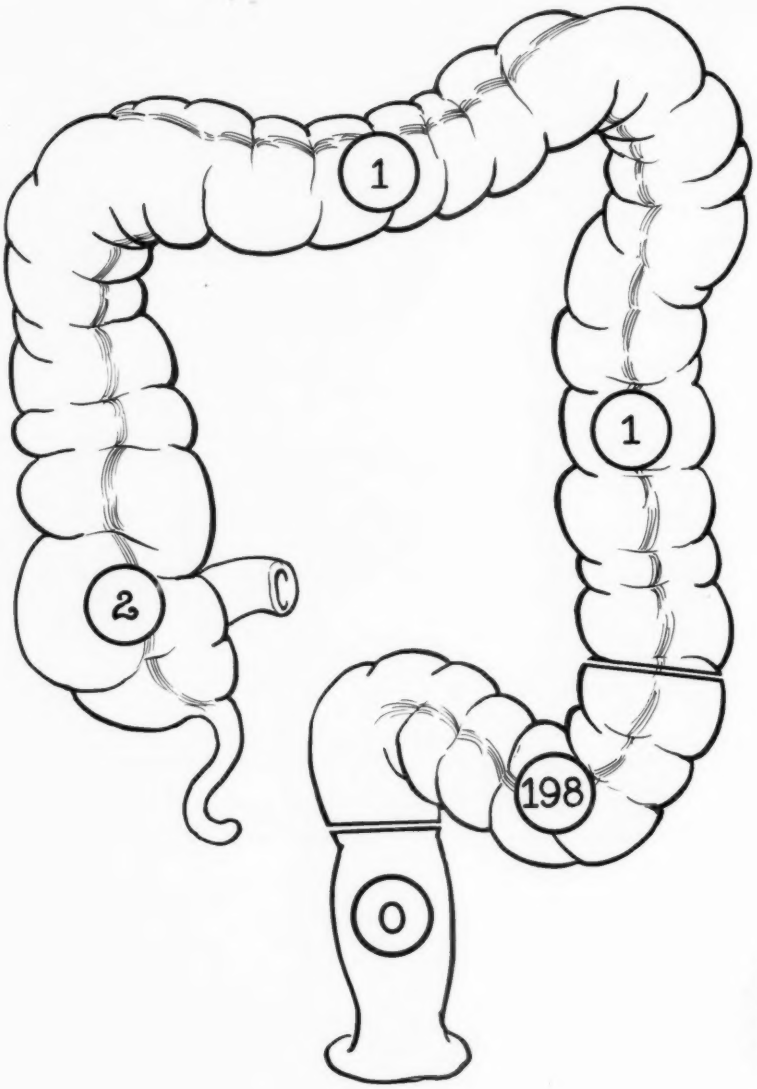


FIGURE 1. Location of lesion in cases in which the diagnosis of diverticulitis was confirmed by the pathologist, 1939 through 1948.

Another interesting point is the duration of symptoms. It is really a long-pull situation and the usual duration of symptoms was two days to twenty-five years with an average of two years and ten months.

I should like to speak for a moment of roentgenologic examination. Figure 2 shows diverticulosis. I think perhaps you can see, with the barium, the little diverticula scattered all around. It is interesting to mention that diverticulosis practically always begins in the left side in the sigmoid and as time goes on the number of diverticula continues to increase and they ascend the colon.

Figure 3 demonstrates diverticulitis. One can follow the mucous membrane pattern of the bowel in contradistinction to observations in cases of malignancy. The specimen after removal is shown in Figure 4.

Figure 5 is included for the purpose of showing the differentiation between a malignant lesion and diverticulitis. The mucous mem-

brane pattern is obliterated at one place and there is a long, involved area at the junction of the descending colon and the sigmoid. In the pattern of the diverticulitis, with the little diverticula coming out, the pattern of the mucous membrane is obvious.

A cutaneous fistula following perforation of abscess and drainage is shown in Figure 6. You see air underneath the skin and the barium following up the fistulous tract may be noted.

FIGURE 2. Diverticulosis.

NEXT I should like to speak about the accuracy of the roentgenologic diagnosis. The roentgenologic examination cannot be done in every instance because owing to the acuteness of the situation too much pressure should not be put on the bowel either from barium or air. A diagnosis was made of diverticulitis, diverticulosis, or obstruction of indeterminate origin in 94 per cent of the cases. The diagnosis of a lesion needing surgical intervention was accurate in 97 per cent. However, in 1.7 per cent of the cases a roentgenologic diagnosis of diverticulitis was made when actually the patients had carcinoma, so one must be very cautious in a situation such as this to be sure of the condition.

Proctoscopic examination was done in 80 per cent of the cases and an accurate or suggestive diagnosis resulted in half of these cases.

Table 3 shows the number of fistulas which were found. Fistulas to the bladder were found in 46 of the 202 cases, to the skin in 27, to the

FIGURE 3. Diverticulitis.

FIGURE 4 (same case as Figure 3). Gross specimen showing numerous diverticula.

small intestine in 5, and to the colon in 3. Eleven patients had combinations of fistulas.

I should like to speak for a moment of vesicosigmoidal fistula, and I will tell you about the patient who is on the cart here. He is a man who came in with a mass in the lower part of the abdomen. A stoma was made in the right side of the transverse colon and an abscess was drained. Following colostomy his condition continued to progress and rupture into the bladder and also into the small bowel occurred. As a result urine, regardless of whether there is a catheter in the bladder, is coming out through the skin fistula.

The problem of what to do with this patient in the future is still unsolved. He is not ready for further surgical procedures. One suggestion for future treatment is to rig up a Murphy type of drip into the distal segment of the bowel and run antibiotic fluids through to clean up the infection as well as possible.

The diagnostic survey in this case has not been entirely completed; it has not yet been determined whether the condition is of neoplastic origin or is diverticulitis. Perhaps it is diverticulitis and if it is, the future will look much brighter for him.

TABLE 3

FISTULAS IN CASES OF DIVERTICULITIS, 1939-1948

SITE	CASES
Bladder	46
Skin	27
Small intestine	5
Colon	3
TOTAL	81*

*Includes 11 cases of multiple fistulas.

Five times as many vesicosigmoidal fistulas occur in males as in females. The reason for this, I believe, is that the uterus protects the bladder.

A good many of the patients who have diverticulitis can be operated on and primary resection can be done. I think as time goes on primary resection and end-to-end anastomosis will be done on more and more patients with diverticulitis who come to surgery. In 10 cases in our group in which that operation was performed, there were no deaths, fortunately, and the preoperative preparation was the same as if a malignant lesion were present.

Of the patients who had operation 73 had resection with end-to-end anastomosis and colostomy proximal to the lesions. Fifty-one had exteriorization and later excision of the loop with proximal colostomy. Forty-one had exteriorization and resection over the three-bladed Rankin clamp, and in those instances they had a catheter colostomy in the proximal barrel. Twenty-five had exteriorization and later excision of the involved loop without colostomy, the old Mikulicz type of operation. A one-stage resection and anastomosis was done in 10 cases.

The mortality rate in all of these procedures combined was 3.5 per cent.

IN summary I wish to bring out some points which I think should be emphasized. First, moderate precautionary measures should be instituted whenever diverticulosis is encountered. Prompt and individualized treatment should be instituted for diverticulitis to reduce the complications, and surgical procedures need rarely be rushed. Long duration of symptoms is an outstanding feature of diverticulitis.

I should like to speak for a moment of what I consider to be inadequate surgery, and why. In the group of 202 cases about which I have

been speaking there were 7 cases in which exploration and closure only were carried out at the first operation. In 4 of these cases persistent fecal fistulas followed this procedure. Instead of exploration I believe transverse colostomy should be performed and followed later by resection, or, if a right rectus incision is made and a growth is found in the left side and it is movable, instead of colostomy in the transverse colon, I believe another incision should be made and either primary resection or an extraperitoneal type of resection should be performed.

Twenty-six patients had drainage alone, and 24 of these later had persistent fistulas. I believe that colostomy should be performed on the transverse colon in all these cases at the time of drainage.

FIGURE 5. Malignant lesion included for purposes of comparison.

In 9 instances local closure of fistulas was attempted, and in 2 out of the 9 this procedure was successful. I believe that all of these patients should have resection in multiple stages, or, more rarely, primary anastomosis following the resection.

I want to thank Dr. Howell and the doctors who brought these 2 patients over; I appreciate their cooperation.

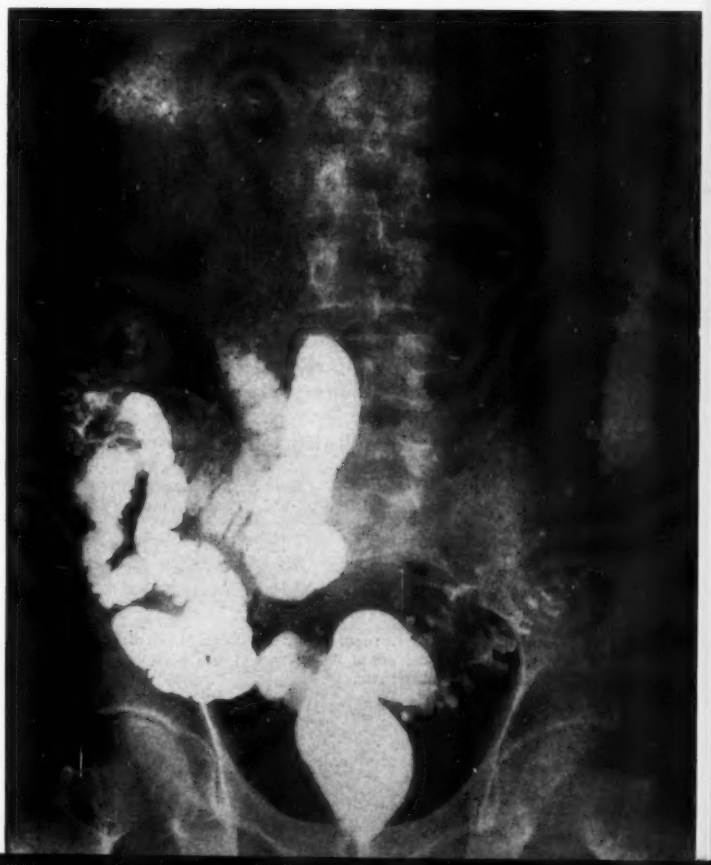


FIGURE 6. Cutaneous fistula.

Diagnostic Clinic

Commissurotomy for Mitral Stenosis

CHARLES P. BAILEY,[1] ROBERT P. GLOVER[2] AND THOMAS J. O'NEILL[3]

HAHNEMANN MEDICAL COLLEGE AND HOSPITAL, PHILADELPHIA

MITRAL stenosis has been an especially challenging subject for the surgeon from the beginning of modern medical history, for two reasons: (1) it is essentially a mechanical stricture which should be as amenable to surgical correction as many other similar strictures; (2) it usually occurs in young individuals who are otherwise generally in good health and who often do not have other serious valvular disease or myocardial dysfunction.

To understand properly the effects of mitral stenosis and the proposed surgical treatment, one must remember that it seriously hinders the passage of blood from the left auricle to the left ventricle. It therefore has two effects: (1) By damming back the blood in the left auricle there is produced hypertension in the entire pulmonary vascular bed (auricle, vein, capillaries, and arteries), which eventually causes great strain on the right ventricle. These individuals, therefore, have dramatic symptoms which are progressively dyspnea, hemoptysis, attacks of pulmonary edema, and eventually right-sided heart failure. This is related to the lesser circulation. (2) Of nearly equal importance is the effect on the greater circulation. The stenosis permits only a diminished amount of blood to be delivered to the left ventricle. Consequently, the output to the general circulation becomes low. This is evident early on vigorous exercise, later on mild exertion, and finally becomes apparent in the bedfast patient.

An anatomic review of the normal valve and its related structures is necessary to the understanding of this discussion. A cross-section of the heart will illustrate the mitral valve partitioning the left auricle from the ventricle. Inversion of the two cusps during ventricular contraction is prevented by the chorda tendineae which are in turn anchored to the papillary muscles.

With rheumatic involvement of the valve certain alterations in appearance and function progressively occur which require further classification. This is necessary from the standpoint of surgical considerations.

Early rheumatic involvement is associated with the appearance of multiple minute vegetations along the free edges of the valve cusps. At this stage there is little or no decrease in the function of the valve.

Progression of the chronic phase of the disease results in thickening of the cusp edges and beginning fusion of the lateral and medial extremities of both cusps to each other. These lines of fusion, separated by the orifice, represent the commissures and tend to immobilize the cusps and narrow the orifice (Figure 1). The heart function thus impaired calls forth compensatory responses. The papillary muscles hypertrophy and the chorda tendineae become fibrosed and shortened. Dilatation begins in the left auricle.

As the disease advances, further deformity results. A stage is reached which is designated

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Presented November 1, 1949, before the meeting of the Interstate Postgraduate Medical Association of North America, Philadelphia, Pennsylvania.

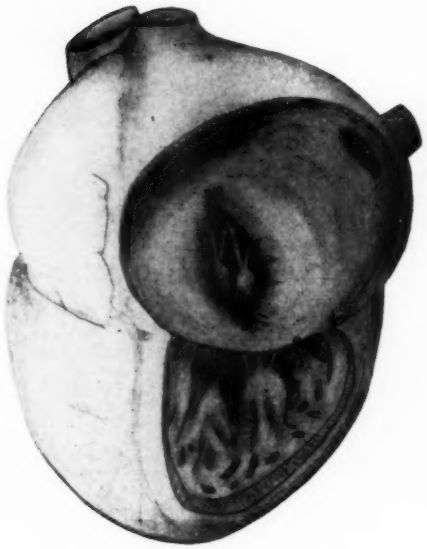


FIGURE 1. EARLY MITRAL STENOSIS. Note thickening and fibrosis of cusp edges; puckering, retraction, and fusion of valve commissures (angles); hypertrophy of papillary muscles, fibrosis of chorda tendineae; early dilatation of left auricle.

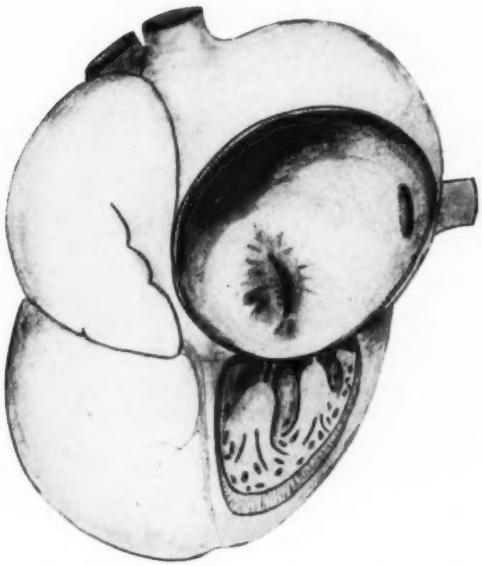


FIGURE 2. TERMINAL MITRAL STENOSIS. Note classical fish-mouth appearance of mitral stenosis with fixation, retraction, and rigidity of mitral ring; dilatation and hypertrophy of left auricle and right heart with beginning enlargement of left ventricle. (Heart rotation to show right-sided enlargement.)

late mitral stenosis. The commissures are more readily identified and the orifice is smaller. Deposition of calcium is often found in the thickened edges. The resultant obstruction throws a greater burden on the left auricle which thickens and enlarges incident to the mounting venous hypertension. It is necessary to examine a cross-section of the stenosed valve to appreciate the cardinal fact that close to the valve ring there is a zone of relatively normal and flexible tissue which has escaped this destructive process.

The terminal state (Figure 2) is represented by extreme narrowing of the orifice, dilatation of left auricle, dilatation of the pulmonary artery, and beginning right heart enlargement. A better appreciation of the changes which occur can be gained by a consideration of the physiologic changes that occur incident to the anatomic alterations in the valve. The normal circulation needs no amplification.

In early stenosis (Figure 3) there is seen in addition to left auricular dilatation, a stasis which results in dilatation of the pulmonary veins and capillaries with the accompaniment of dyspnea and perhaps hemoptysis and pulmonary edema. Auscultation may reveal a beginning systolic murmur, reduplicated second sound, and perhaps a mid-diastolic murmur.

In late stenosis (Figure 4) the pulmonary artery dilates in response to progressive increase in pulmonary back pressure. Of course, the right ventricle also enlarges. At this time the pulmonic second sound becomes accentuated. At the apex, the mid-diastolic murmur becomes drawn out to coincide with the beginning of systole. Premature contractions and even auricular fibrillation may appear as the myocardium becomes overstrained. The heart is seen to be greatly enlarged in the terminal stage (Figure 5). In addition, other changes have taken place. Where the back pressure rises sufficiently in the right ventricle there occurs a functional incompetency of the tricuspid valve. Then at last the right auricle dilates and along with it blood is dammed back to produce enlarged liver, peripheral edema, ascites, and even left ventricular enlargement. Many patients die before this stage is reached.

It must be understood that these changes rep-

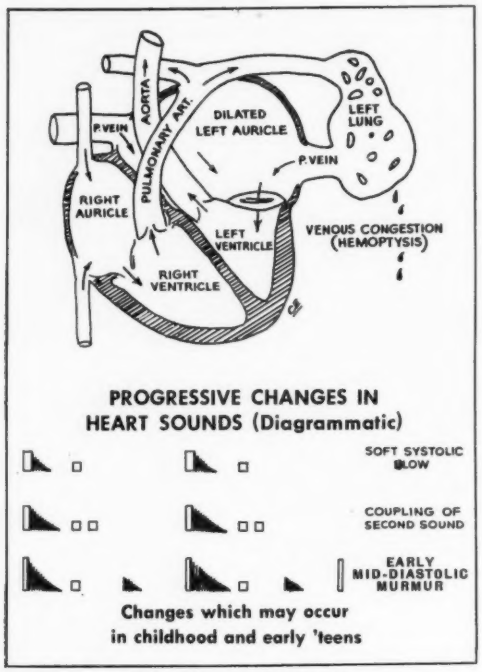


FIGURE 3. EARLY MITRAL STENOSIS.

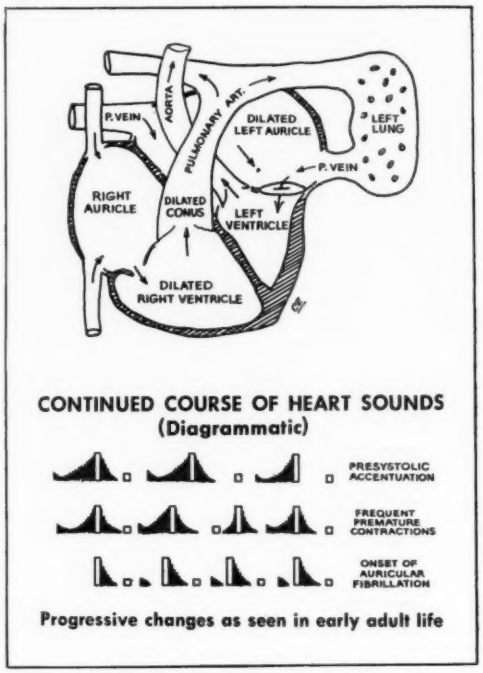


FIGURE 4. LATE MITRAL STENOSIS.

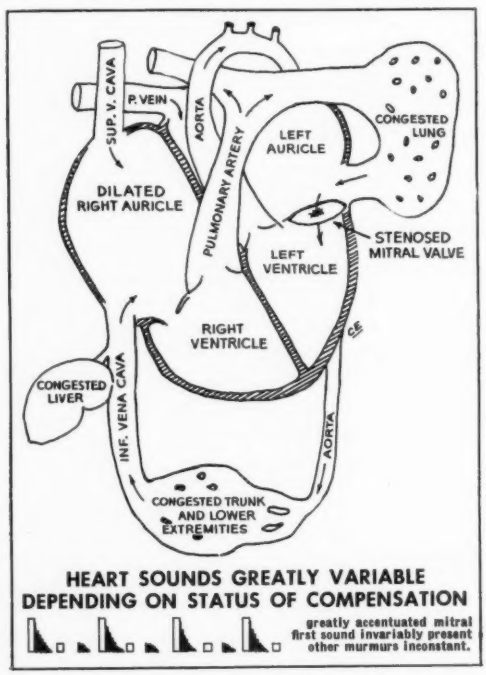


FIGURE 5. TERMINAL MITRAL STENOSIS.

resent only part of the picture. In addition there is a failure of sufficient blood reaching the left ventricle which accounts for its small size except in the terminal stage. Consequently the cardiac output is diminished. This is evidenced by the lowering of the systemic blood pressure, progressive inability to withstand exercise, and increasing somatic weakness.

GENERALLY, therefore, investigations have followed two approaches designed to afford relief. One may be referred to as the indirect approach, and is aimed at merely reducing the high left auricular pressure and makes no effort toward relieving the obstruction and permitting an improvement in the cardiac output. The other is the direct approach and will be considered in detail later.

The indirect approach may be extracardiac or intracardiac. Sweet and Bland have reduced the auricular pressures in certain cases by anastomosing the azygos vein to the right superior pulmonary vein, thus taking advantage of that pressure gradient between left and right auricles.

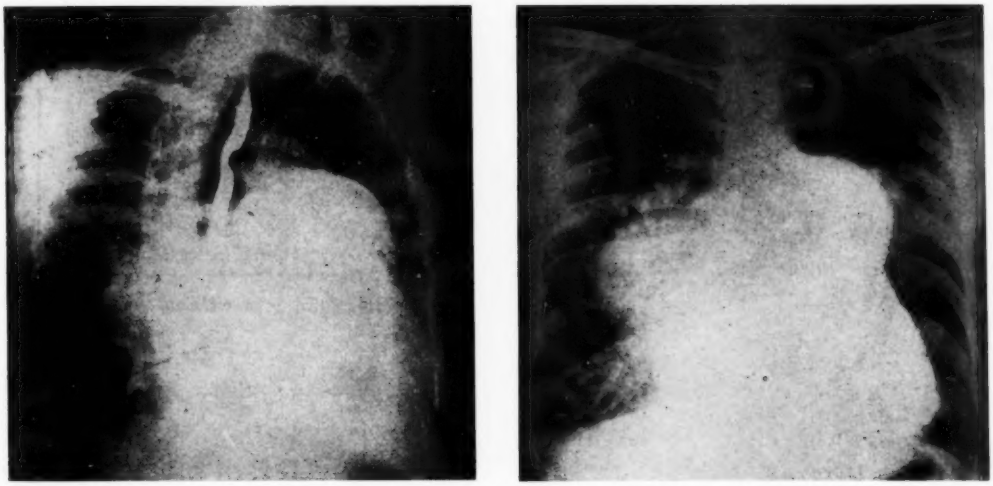


FIGURE 6. Lutembacher syndrome showing enormous dilatation of the pulmonary artery. Anterior-posterior and right anterior-oblique positions. Adult. (Reproduced from Taussig's "Congenital Malformations of the Heart," published by The Commonwealth Fund.)

We made a similar attempt by incising the foramen ovale to accomplish more directly the same shunt mechanism. That this was accomplished is evidenced by the fatal lowering of the cardiac output and objective evidence of the patent shunt seen three days postoperatively. The realization of only one of these observations was enough to convince us of the dire results possible in a shunt of this type. Furthermore, both methods attempt to produce a condition similar to that found in Lutembacher's syndrome. We need not emphasize the unphysiologic situation resorted to in so doing. A glance at the cardiac outline of one such case (Figure 6) will attest to this. The oblique view of the barium column shows no dilatation of the left auricle because of the interatrial shunt. By the overloading of the right auricle and ventricle most of the burden of strain is borne by the right heart.

While a procedure aimed at producing such a shunt, if it succeeds, will reduce the pressure in the pulmonary circulation, it does so at a great disturbance of physiology. You must remember that the pulmonary hypertension is in effect compensatory to the stenosis, in that greatly increased pressure in the left auricle, a pressure of perhaps 40 mm. of mercury higher than the normal systemic arterial pressure, forcibly drives the blood through the narrowed mitral orifice. It maintains compensation to the very end. If one reduces that compensatory mechanism (pulmonary hypertension) without simultaneously relieving the mitral stenosis, you must greatly interfere with the filling of the left ventricle.

We present the direct approach as eliminating these objections and more nearly approaching the ideal of normal cardiac function. To accomplish this it is necessary to operate directly on the diseased valve. The condition and appearance of the valve vary, as will be seen in Figure 7. There may be considerable distortion with certain variations. The commissures lead off in line with the limbs of the flattened orifice. The peripheral zone about the darkened areas represents relatively normal pliable tissue.

In those cases of preponderant regurgitation, the opening is ovoid and not slitlike (Figure 8), consequently cutting even both commissures does not relieve much of the stenosis and indeed may even result in increased regurgitation.

Among the earlier attempts to relieve the stenosis, technics utilizing incision of the valve cusps were employed. This not only fails to relieve the stenosis but on the other hand increases the regurgitant factor to a fatal degree.

Punch excisions of the anterior cusps when inadequate fail to relieve the stenosis, and when adequate result in severe regurgitation.

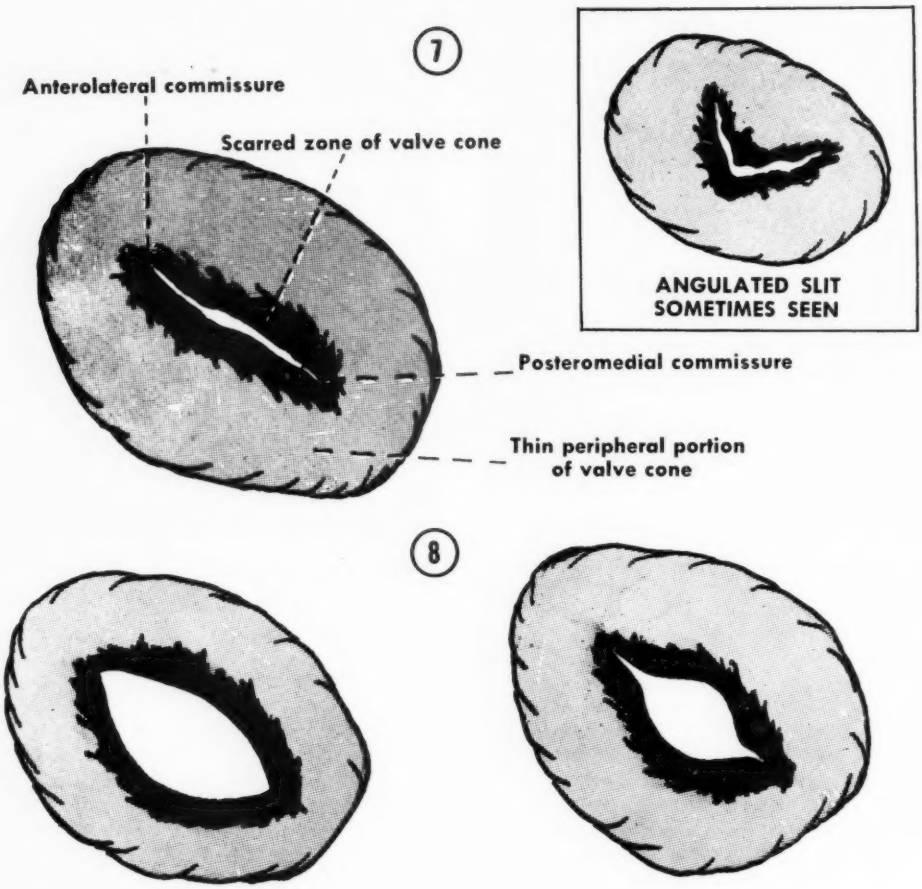


FIGURE 7. MITRAL STENOSIS.

FIGURE 8 *(left)*. Mitral orifice in preponderant mitral regurgitation. Valvular surgery of questionable value by our present concepts. *(right)*. Mixed mitral regurgitation and stenosis. Only partial relief can be accomplished in proportion to the amount of stenosis present.

FIGURE 9 *(left)*. Commissurotomy by direct finger or "digital vision." *No additional regurgitation is produced. (right)*. Wide opening of valve during ventricular diastole (0.9 of cardiac cycle). Because the valve is normally open, the cut edges are kept apart and do not tend to heal (12 months—dogs; 2½ months—humans).

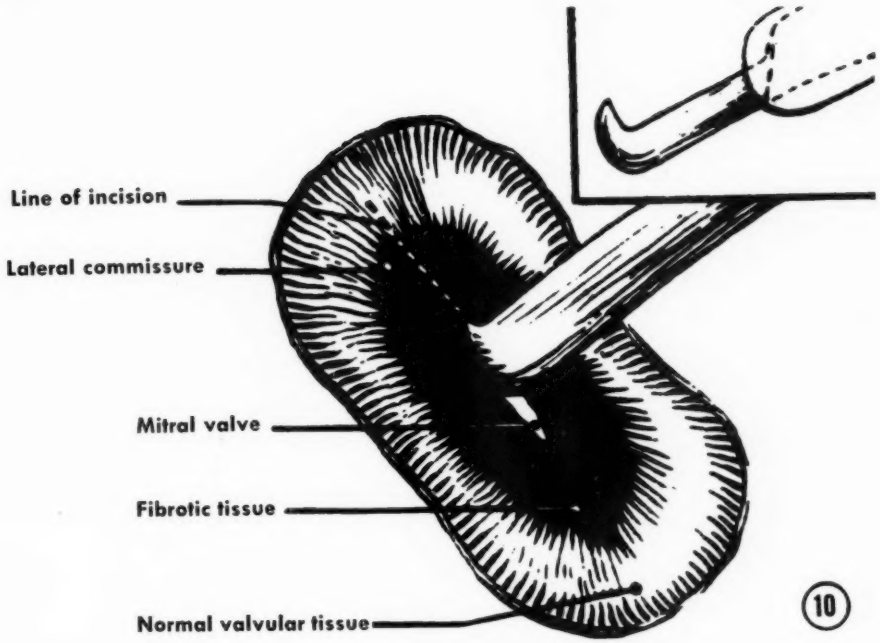


FIGURE 10. Direction and line of incision for commissurotomy.

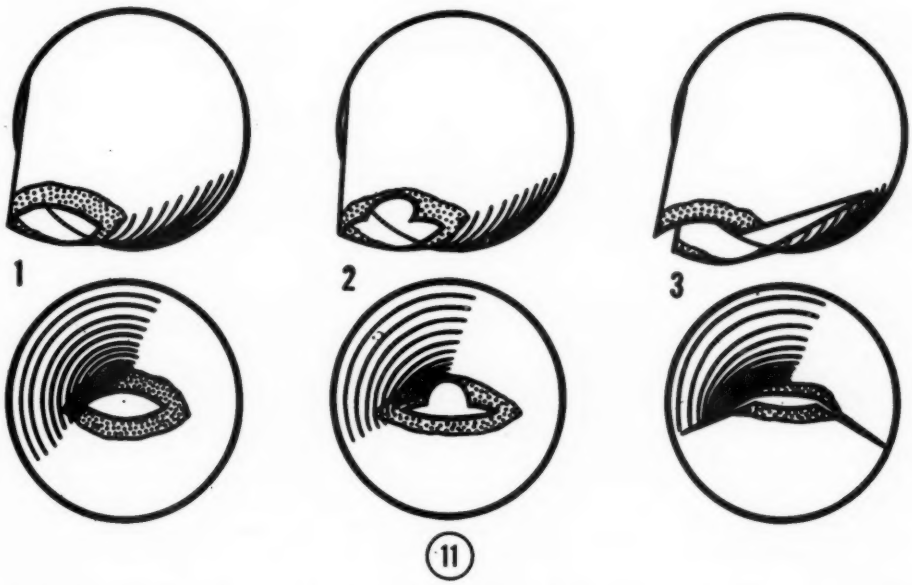
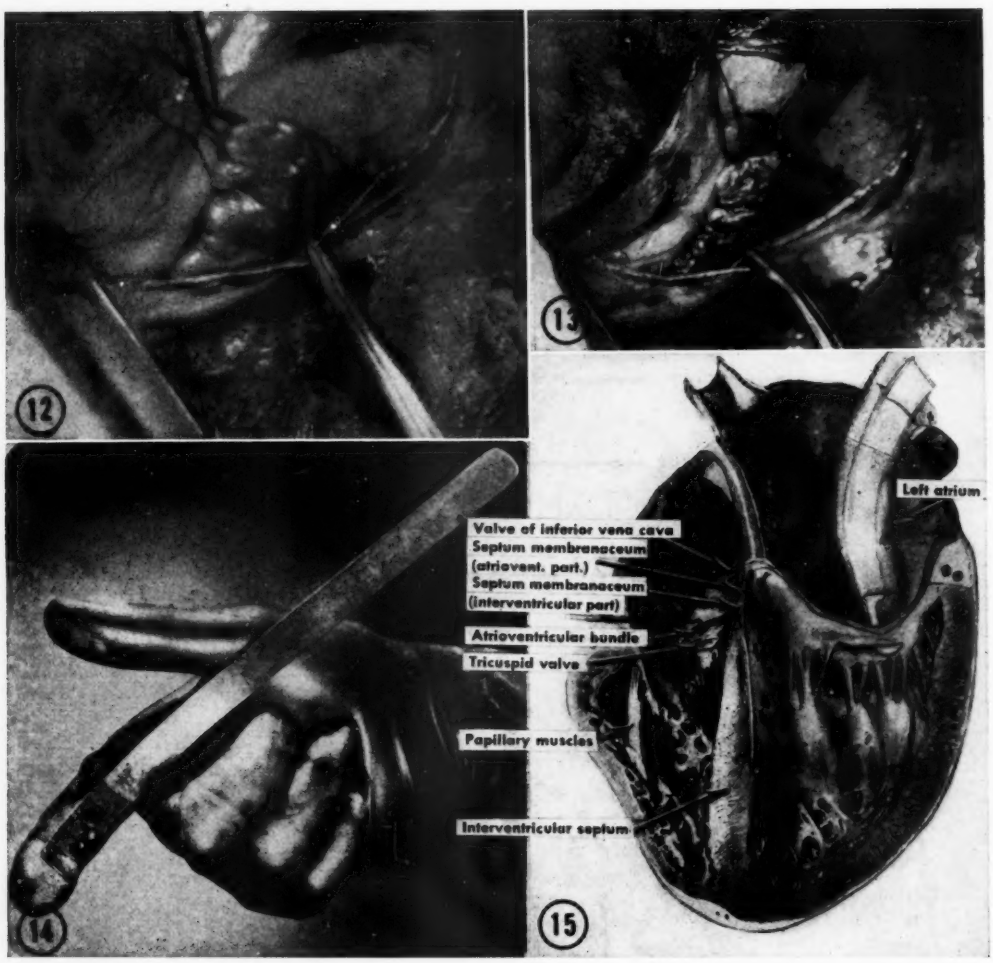


FIGURE 11. Three-dimensional view of (1) the stenotic valve cone, (2) the cusp excision technic, and (3) the preferred commissurotomy technic.



FIGURES 12 to 15. STEPS IN OPERATIVE PROCEDURE. (12) The pericardium is opened anterior to the phrenic nerve, allowing exposure of the auricular appendage. (13) A purse-string ligature is placed about the base of the appendage, followed by temporary placement of a clamp at the same level. (14) Operator's right hand is doubly gloved to allow the index finger to bear the special knife. (15) The knife is advanced beyond the fingertip and engaged along the lateral commissure.

A more rational but highly dangerous approach has been the technic of forcing a tear through the commissures by digital dilatation. Unfortunately, the weakest point is often not at the commissures but may be in the anterior cusp. A tear cannot be controlled at all and so is relegated as an undesirable procedure.

On the other hand, punch excision of the posterior cusp is subject to somewhat better control. However, it can be accomplished with an instrument possessing no visual control and minimal sensitivity. The idea was advanced that using the punch to excise the commissures would be a better procedure (commissurectomy) and approaches the idea of commissurotomy.

The reason Dr. Harken prefers this is that he feels there is some risk that a commissurotomy may heal, whereas a commissurectomy would surely never heal. Our objection to it is that a punch operation causes some regurgitation in most cases and we feel it is dangerous. We think the risk of healing is very slight with a

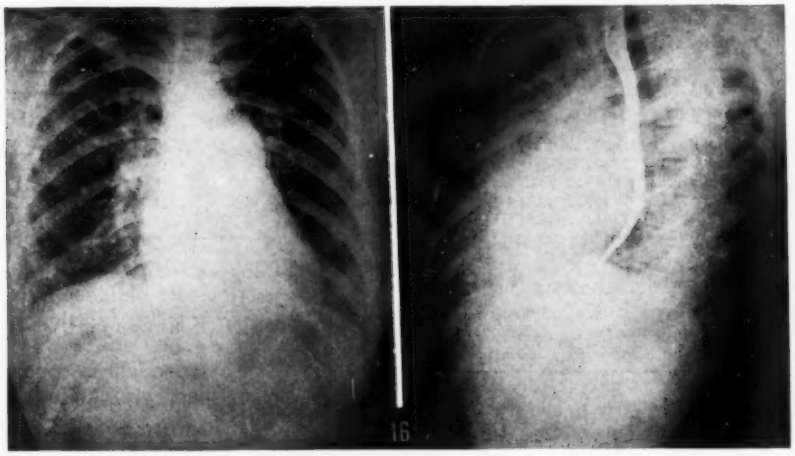


FIGURE 16. Roentgenologic comparison of typical case. Preoperatively—prominence of left pulmonary artery, pulmonary vascular congestion, and enlarged left auricle.

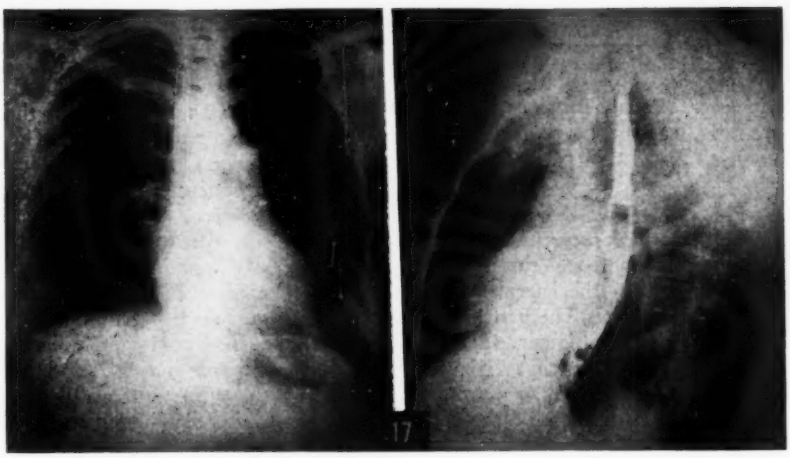


FIGURE 17. Six months postoperatively—cardiac silhouette is smaller, diminution of left pulmonary artery (overshadowed somewhat by an adhesion), and considerable decrease in size of left auricle.

simple but adequate commissurotomy. Also, commissurotomy is readily performed under direct digital guidance whereas, for technical reasons, commissurectomy is essentially a blind operation.

Our representation of commissurotomy is shown in Figure 9. Under direct digital vision or guidance the commissures are cut through the scar tissue well into the flexible membrane, and then the valve is capable of opening wide in auricular systole, but it closes quite well on ventricular systole. This is commissurotomy rather than commissurectomy as discussed previously.

One is justified in asking why the cut valve will not heal. We believe this to be understandable because of the fact that the edges are separated for nine-tenths of the cardiac cycle, thus are closed only one-tenth of the time. It is difficult for tissues separated by incision to heal. One of our early patients who had cusp incision rather than commissurotomy died two and one-half months after surgery and showed no tendency to heal.

Commissurotomy has been performed in most cases using a simple knife. Its direction and line of incision are illustrated in Figure 10. Figure 11 shows three-dimensionally: (1) the stenotic valve cone, (2) the cusp excision technic, and (3) the preferred commissurotomy technic.

TABLE 1
MITRAL STENOSIS
Pressures Recorded by Lilly Manometer (Millimeters of Mercury)

	PREOPERATIVE		POSTOPERATIVE	
	RV	PA	RV	PA
6. J. B. (2/2/49)...	96.2/19.6		48.6/2.7	48.6/16.1 (1 month)
7. S. C. (3/23/49)		47.8/2.8		25.9/2.7 (1 month)
8. E. W. (4/20/49)..	72.8/0.0	70.3/25.2	57.9/1.3	66.1/21.2 (1 month)
9. V. S. (6/27/49)..141/4.5		143.3/53.3	45.2/1.3	43.8/13 (4 months)
11. G. B. (8/3/49)...	68.8/1.3	58.5/20.8	33.3/0.4	39.3/18.3 (2 months)

TABLE 2
MITRAL STENOSIS
Pressures Recorded During Surgery by Lilly Manometer (Millimeters of Mercury)

	LEFT AURICLE	
	Before	*After* (commissurotomy)
6. J. B.	45.1/30.3	14.5/2.6
8. E. W.	35.8/16.5	6.9/1.3
9. V. S.	30.2/16.0	22.1/7.5
11. G. B.	45.5/7.8	39.0/6.5

However, bilateral incisions in the commissures are not always necessary.

OPERATIVE PROCEDURE

The operative procedure is done either from the anterior approach through the third or fourth rib bed or the lateral approach through the third interspace. The pericardium is opened anterior to the phrenic nerve allowing exposure of the auricular appendage (Figure 12). Then, following procaine block, a purse-string ligature is placed about the base of the appendage and this is followed by temporary placement of a clamp at the same level (Figure 13). The redundant appendage is then amputated.

At this point the operator's right hand is doubly gloved to allow the index finger to bear the special knife as illustrated (Figure 14). The appendage clamp is released as the index finger and knife are slid into the left auricle. Hemostasis is assured by tightening the purse string. The internal architecture of the auricle is leisurely investigated with the palpating finger. The absence of an interatrial defect is confirmed. The character, size, location, and direction of the mitral orifice are determined. It is now possible to direct the incision intelligently and so the knife for the first time is advanced beyond the fingertip and engaged along the lateral commissure (Figure 15). The entire length of the commissure is cut through so as to reach the normal flexible zone. Only when necessary to improve valve function is the medial commissure cut.

The operation is concluded by withdrawing the finger and knife and closing the purse string. The appendage stump is oversewn as a further precaution against hemorrhage. The closure of the chest is carried out in the routine manner.

RESULTS OF OPERATION

In an evaluation of the results many factors must be considered. The roentgenologic comparison of the typical case is illustrated. Preoperatively (Figure 16) there is seen prominence of the left pulmonary artery, pulmonary vascular congestion, and enlarged left auricle. Six months postoperatively (Figure 17) the cardiac silhouette is smaller, there is diminution of the left pulmonary artery (overshadowed somewhat by an adhesion), and considerable decrease in the size of the left auricle. This was the earliest successful case. The patient is clinically rehabilitated and enjoys normal activities.

Beginning with the sixth case we began to secure intrathoracic vascular pressure readings on most of the succeeding patients. Some of these pressures are recorded here (Tables 1 and 2) and represent our best guide to date indicating degree of improvement. As might be expected it is not always expedient to get pressures of the left auricle at the time of surgery even though desirable. We recognize that the pressures are recorded down to the fractional values, which is not necessary. They do show a remarkable drop and need no further elaboration.

The original indications and contraindications (Tables 3 and 4) have not been changed to date.

We would like to show you 2 patients.

This young lady had the operation a month ago and at the present time is here for checkup of her pressures. Because of lack of time I will only ask her to stand up. She has changed from

TABLE 3

INDICATIONS (AT PRESENT) FOR VALVULAR SURGERY FOR MITRAL STENOSIS

1. MOST FAVORABLE GROUP
   a. Excessive fatigability.
      Increasing exertional dyspnea.
   b. No rheumatic activity.
      Normal sinus rhythm.
      Lesion predominantly stenosis.
      Evidence of significantly increased pulmonary hypertension.
2. LESS FAVORABLE GROUP
   The above plus:
   a. Recurrent bouts of hemoptysis.
   b. Arterial embolic phenomena.
   c. Auricular fibrillation without failure.

TABLE 4

CONTRAINDICATIONS (AT PRESENT) FOR VALVULAR SURGERY FOR MITRAL STENOSIS

1. Active rheumatic infection.
2. Presence of superimposed subacute bacterial endocarditis.
3. Cardiac failure uncontrollable by medical means.
4. Presence of marked associated mitral regurgitation or other valve (aortic) deformities.

a cardiac invalid who could not dress herself to one who is now doing a large part of her work.

THE other patient is a physician. He has a long history of mitral stenosis with four attacks of embolism, two of them cerebral, and finally he had this operation and is now three months postoperative. He will show you his scar and perhaps say a word or two about how he feels.

DR. BROWN: I am able to do about two-thirds to three-quarters of a day's full-time work now without any discomfort.

DR. BAILEY: This is the typical incision. I did want you to hear from Dr. Brown himself something of the relative condition before and after operation.

DR. BROWN: Before operation I was troubled with cough; I couldn't carry out my normal activities at all without coughing. I wouldn't have been able to talk this much without having a coughing spell. That has all disappeared, and it disappeared immediately. In fact, I was very much surprised to awaken from the operation and find the cough had improved so much.

DR. BAILEY: Thank you.

COMING POSTGRADUATE COURSES

Kansas Medical Society, Kansas State Board of Health and University of Kansas School of Medicine

Six months postgraduate course, circuit type, beginning December 5, 1950, at the following cities in Kansas: Iola, Coffeyville, Newton, Junction City, Beloit, Colby, Garden City and Great Bend. For details, write to Extension Program in Medicine, University of Kansas Medical Center, Kansas City 3, Kansas

University of Minnesota Medical School, Minneapolis

Continuation course in child psychiatry for pediatricians and physicians, at the Center for Continuation Study, November 27-December 1. Drs. Ralph D. Rabinovitch and John Waterman will participate as lecturers and group discussion leaders, with Dr. Reynold A. Jensen, head of the Child Psychiatry Service of the University, in charge of arrangements

Diagnostic Clinic

Surgical Treatment of Ulcerative Colitis

L. KRAEER FERGUSON*

WOMAN'S MEDICAL COLLEGE OF PENNSYLVANIA, PHILADELPHIA

ULCERATIVE colitis is a disease which for a long time was considered a medical problem. Surgery was considered only in the end stages when it was apparent that the patient was going downhill and that something had to be done. I should like to show you the results of surgical treatment of ulcerative colitis, and I have asked some of my patients to come here in order that you may see that a patient with ulcerative colitis can be a normal, happy individual who lives an active, productive life.

TO THE PATIENT: How old are you?

PATIENT: Thirty-nine.

DR. FERGUSON: And you have had ulcerative colitis how many years?

PATIENT: Twenty.

DR. FERGUSON: Of that period of twenty years, part of it was not too bad, but for the past ten years you were practically unable to work; is that correct?

PATIENT: Yes.

DR. FERGUSON: This patient had a typical left-sided ulcerative colitis (Figure 1), and she was treated following our principles of doing a fecal diversion at the most distal portion of normal gut. Her normal gut extended to the mid-transverse colon, so she was treated by a resection of the left side of her colon, including the terminal rectum and anus.

Her resected specimen, the entire left side of her colon and rectum, is shown in Figure 2. She now has a transverse colostomy.

Since you were operated on have you been able to work?

PATIENT: Yes, I have.

DR. FERGUSON: Every day?

PATIENT: Every day.

DR. FERGUSON: How long after you were operated on did you start to work?

PATIENT: About two months.

DR. FERGUSON: Do you find it necessary to wear an apparatus at all?

PATIENT: Yes, I do.

DR. FERGUSON: What do you wear and how do you take care of yourself?

PATIENT: Well, I have a bag, but I don't use it. I use Kleenex in it and dispose of the Kleenex if anything goes into the bag.

DR. FERGUSON: You are able to be about as a silverware salesman?

PATIENT: That is right.

DR. FERGUSON: You meet people and go about and do everything that anybody else does?

PATIENT: Yes, I do.

DR. FERGUSON: I understand you are contemplating getting married.

PATIENT: Yes, sometime in the near future.

DR. FERGUSON: I simply mention that to show that your colostomy is not an incapacitating disability.

PATIENT: No, it isn't.

DR. FERGUSON: The second case to be presented is 12 years old. Her ulcerative colitis began a year or two ago.

She was incapacitated, had to leave school, was in bed practically all the time for a period of about a year. Her condition involved practically the entire bowel except the sigmoid and lower rectum. She was threatening perforation, with a high fever, so as an emergency procedure she was operated upon and an ileosigmoidostomy was performed. The distal ileum and the sigmoid were brought out onto the abdominal wall.

*Professor of Surgery, Woman's Medical College of Pennsylvania, Philadelphia; Professor of Surgery, Graduate School of Medicine, University of Pennsylvania.

Presented November 3, 1949, before the meeting of the Interstate Postgraduate Medical Association of North America, Philadelphia, Pennsylvania.

How long after your first operation were you operated upon the second time?

PATIENT: About ten months.

DR. FERGUSON: The colon was resected and she had an ileosigmoidostomy.

How many movements do you have a day now?

PATIENT: Two and sometimes three.

DR. FERGUSON: You go to school?

PATIENT: Yes.

DR. FERGUSON: You have gained about 40 pounds in weight, is that right?

PATIENT: Yes.

DR. FERGUSON: This is one of the types of cases in which we can anastomose. They have normal movements through the rectum. Do you feel good?

PATIENT: Yes.

DR. FERGUSON: This next patient had a diffuse ulcerative colitis which involved almost all of his colon except the sigmoid and rectum.

How long were you sick before you were operated on?

PATIENT: Eight months.

DR. FERGUSON: And you were in the hospital practically all the time?

PATIENT: All the time.

DR. FERGUSON: He was operated upon and an ileostomy was performed. You went how long with your ileostomy alone?

PATIENT: Six months.

DR. FERGUSON: How much weight did you gain following your ileostomy?

PATIENT: A hundred pounds.

DR. FERGUSON: You can see he did not fool when he came to eating. He then had a colectomy in two stages, and finally we were able at the second operation to re-unite his ileum with his sigmoid, so that he has an ileosigmoidostomy with the entire colon out.

FIGURE 1. Long-standing left-sided colitis.

Figure 3 is an x-ray picture of his distal colon. This boy, who is married, had a child during the time that he had an ileostomy—that is, his wife did—and he now is in excellent general health, I would say.

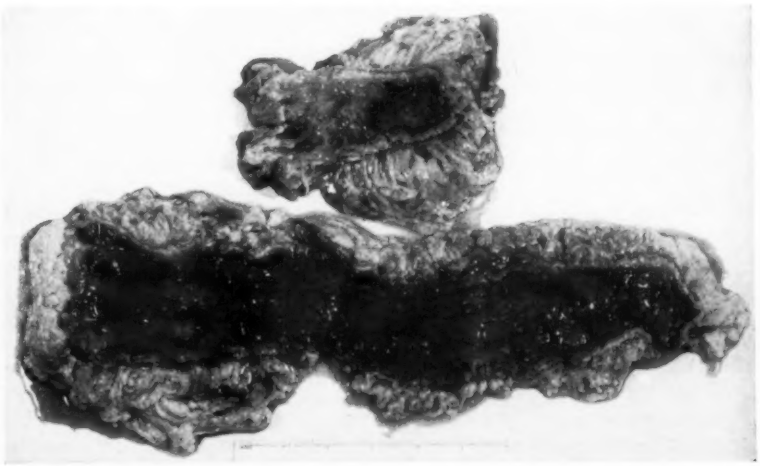


FIGURE 2. Same patient —specimen of distal colon and rectum.

FIGURE 3. Widespread ulcerative colitis in which the sigmoid and rectum escape. It was possible to do an ileosigmoidostomy in this patient after periods of bowel rest by ileostomy.

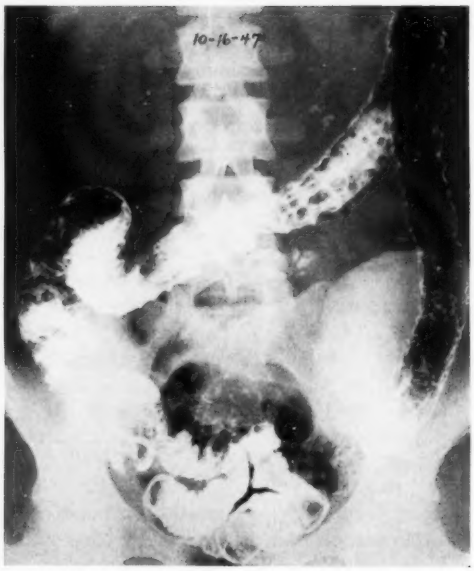


FIGURE 4. Widespread involvement of the colon in the ulcerative colitis process.

PATIENT: Correct.

DR. FERGUSON: Are you working every day?

PATIENT: Every day.

DR. FERGUSON: How many movements do you have a day?

PATIENT: Two, tops three.

DR. FERGUSON: Are your movements formed?

PATIENT: Not formed, but they are not loose.

DR. FERGUSON: Do you feel well?

PATIENT: Very well.

DR. FERGUSON: Mrs. D., our next patient, is a young housewife who was troubled with ulcerative colitis for how long?

PATIENT: I was in the hospital in 1935.

DR. FERGUSON: And ever since then you have been troubled with ulcerative colitis until you were operated on?

PATIENT: Yes.

DR. FERGUSON: She had an involvement of practically her entire colon. An ileostomy was performed and following that a subtotal colectomy. She still has the rectum and sigmoid in place. How do you get along now, Mrs. D.?

PATIENT: Just fine.

DR. FERGUSON: How much weight have you gained since your operation?

PATIENT: Approximately 20 pounds.

DR. FERGUSON: You are a housewife, you live a normal life, and you do everything you want to do?

PATIENT: Yes, Doctor.

DR. FERGUSON: Thank you. Now for our next patient. How old are you?

PATIENT: Thirty-two.

DR. FERGUSON: This is a 32-year-old patient whose ulcerative colitis began in 1942, but in 1945 she became totally incapacitated and was unable to do anything more than sit somewhere near a bathroom because of frequent stools and bleeding. Is that correct? (Figure 4.)

PATIENT: That is right.

DR. FERGUSON: She was operated upon and an ileostomy was performed because of her hemorrhage and her chronic colitis. Soon after her operation her bowel perforated, so that as an emergency a colectomy was performed.

Will you tell us a little about what you are doing now?

PATIENT: I am very happily married and leading a very normal life, doing everything anybody else could do.

DR. FERGUSON: She has been married since her ileostomy and colectomy. You don't feel that

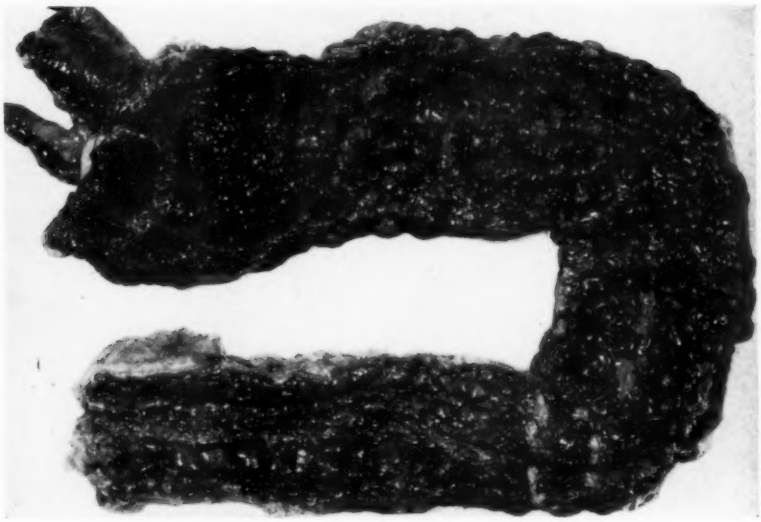


FIGURE 5. Resected specimen of bowel in a patient with complete involvement of the colon in the ulcerative process. The chief symptoms in this patient were bleeding and hemorrhage, necessitating as an emergency, ileostomy and subtotal colectomy.

you are handicapped by your ileostomy?

PATIENT: Not at all. I enter into anything I want to do, I go swimming, I take rides, I do anything. I have gained over 40 pounds in weight.

DR. FERGUSON: If you had it to do over again would you be willing to choose an ileostomy in comparison to the way you were?

PATIENT: I think so.

DR. FERGUSON (to the next patient): How old are you?

PATIENT: Fifty-one.

DR. FERGUSON: This is another patient whose colitis began as a slow-growing colitis and progressed to involve his entire colon.

Figure 5 shows the colon of the patient standing here. You can see the terrific destruction of the mucosa of the colon. This patient was also a bleeder. He passed casts of his colon in clot. He was operated on as an emergency; an ileostomy was performed, and later a colectomy. Later his rectum was removed because of continued bleeding from his lower segment.

What do you do now?

PATIENT: I am a research chemist.

DR. FERGUSON: Do you work every day?

PATIENT: Every day.

DR. FERGUSON: Do you find yourself handicapped with your ileostomy?

PATIENT: Not for the type of work I do.

DR. FERGUSON: Would you mind showing these people your ileostomy? This patient has an ileostomy bag of the Rutzen type which cements itself to the skin around the ileum. There is a little spigot at the end which is closed by a rubber band which permits him to go into the toilet and release the contents of the bag, and that is all that is necessary to take care of it.

How often do you have to empty your bag?

PATIENT: Four times a day.

DR. FERGUSON: But it doesn't bother you? At night does it leak at all?

PATIENT: It requires a certain amount of adjustment to get used to it, but once you are used to it you don't have much trouble.

DR. FERGUSON: Thank you.

THE next patient has had colitis since 1931. At that time she was bleeding so much that an emergency ascending colostomy was performed at the distal portion of her normal gut. She then went along for many years, until her husband died, when her retained colon again began to bleed and she came into the hospital. We have since that time removed her entire colon and given her an ileostomy.

Since her operation she has married again and is living what I believe is a normal life. Will you tell us how you get along every day?

PATIENT: Just wonderfully. I do my house chores and enjoy life just as any other human being does. In fact, I forget I have it half the time.

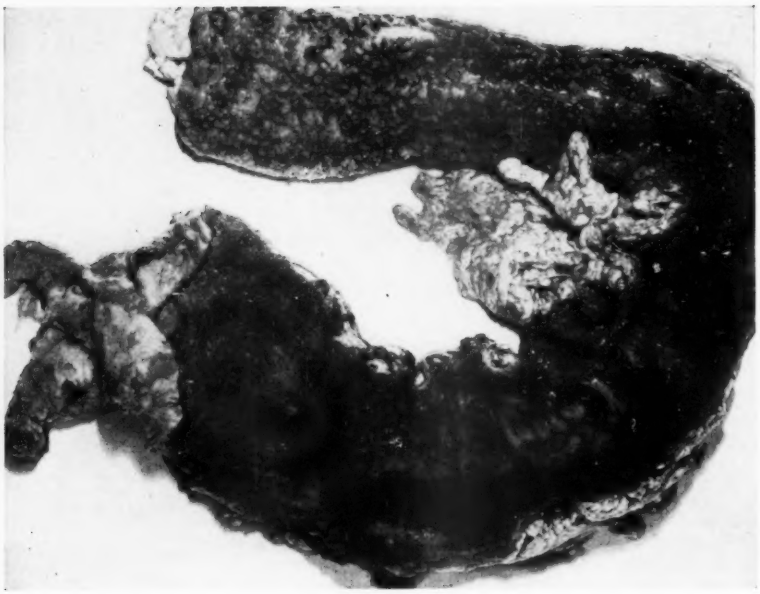


FIGURE 6. Resected specimen of colon in a patient with ulcerative colitis who had a perforation four days following ileostomy.

DR. FERGUSON: You do?

PATIENT: Yes.

DR. FERGUSON: Your ileostomy, in other words, does not incapacitate you?

PATIENT: I really forget about it. I don't know it is there, and start feeling for it sometimes. Like everything else, you get used to it.

DR. FERGUSON: You feel perfectly well?

PATIENT: Yes, now I am just fine. I take a hike every morning about two miles, do my shopping, house chores, and I do as much as any one else, so I guess that is all.

DR. FERGUSON: I would like to know if anybody would like to ask any of these patients any questions. If not, I would like to discuss the treatment of ulcerative colitis, from a surgical point of view.

We believe that ulcerative colitis becomes a surgical disease when it can no longer be handled medically; when the patients are chronic invalids surgery certainly should be considered. We have divided the treatment of ulcerative colitis into two chief groups: (1) those requiring immediate or emergency surgery—cases of perforation, hemorrhage, and obstruction; (2) those requiring elective surgery. The resected specimen of a colon of a patient with a perforation may be seen in Figure 6. The patient had an ileostomy and then perforated, and I should like to say that the fact that the patient has had an ileostomy does not prevent the possibility of perforation. In these cases of perforation, emergency surgery must be performed, and the surgery that we believe is indicated is removal of the diseased gut. Drainage itself is an inadequate procedure in most of these cases.

Hemorrhage is a complication of ulcerative colitis which demands operation. It used to be thought that hemorrhage was a contraindication to operation, but we now feel that it is not a question of the patient's being too sick to be operated upon; it is really a question of the patient's being too sick not to be operated upon. When you see these diseased colons stripped of mucous membrane, oozing over the entire surface of the colon, it is hard to see how conservative therapy would suffice. Nothing less than removal of the diseased colon is going to stop the progress of the disease in spite of the fact that you transfuse them in enormous amounts.

Obstruction is not an infrequent cause of difficulty in ulcerative colitis. The obstruction comes from inflammatory swelling and constriction of the gut. Many times perforation is associated with obstruction. Figure 7 shows marked dilatation of the colon because of obstruction of an inflammatory nature at the splenic flexure. This patient had perforation, and the

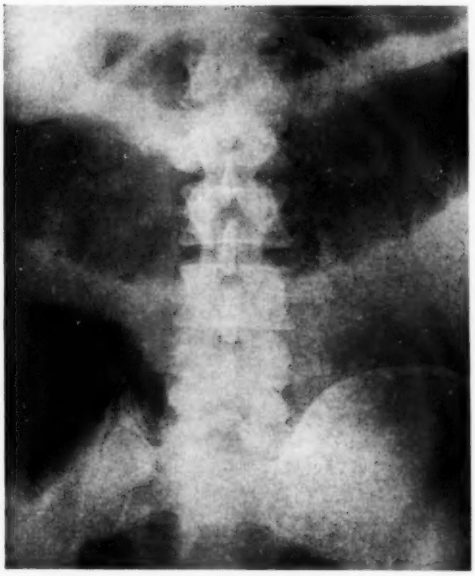


FIGURE 7. Marked dilatation of colon in a case of ulcerative colitis in which there was an acute inflammatory obstruction at the splenic flexure. See also Figure 11 which illustrates the chronic type of obstruction that occurs in ulcerative colitis.

(Reproduced from: "The Surgery of Complications of Ulcerative Colitis," by Ferguson, Kraeer, and Stevens, Lloyd W., Gastroenterology, November, 1948, published by Williams & Wilkins.

FIGURE 8. An example of pseudopolyposis in a long-standing case of ulcerative colitis. It happened in this case that the colitis did not involve the sigmoid so a subtotal resection and ileosigmoidostomy were possible.

gut was removed almost immediately following an ileostomy.

In certain cases of ulcerative colitis emergency surgery is not necessary, but we believe elective surgery is imperative. Some of these are intractable cases who do not respond to medical therapy. We find that these patients may get along fairly well with a simple diversion of the fecal stream by ileostomy or colostomy, but because of the danger from retention of the diseased colon, we believe that the colon itself should be removed in almost all cases.

Figure 8 is an example of the type of disease which we call polyposis. Whether this is a true polyposis or a pseudopolyposis is not well understood. The fact remains, however, that such a gut never recovers, and even though an ileostomy is performed the disease continues to progress and a colectomy should be done.

Granulomata appear in many cases of colitis—an acute inflammatory process involving the colon which in the x-ray is indistinguishable from carcinoma. Figure 9 shows the granulomatous lesions which occurred in one pa-

FIGURE 9. An example of ulcerative colitis associated with granulomatous lesions of the bowel. These produced in the x-ray an appearance which might be mistaken for carcinoma and at operation they are very frequently indistinguishable from carcinoma. A colectomy must be performed in these patients.

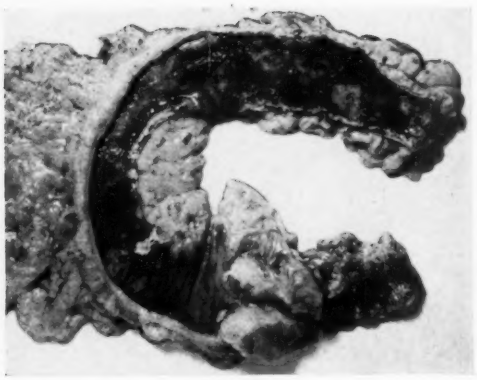


FIGURE 10. Specimen of bowel of a patient who had had ulcerative colitis for eleven years. At that time she first consented to operation, at which time a carcinomatous mass was found present in the cecum.

(Reproduced from: "The Surgical Management of Ulcerative Colitis," by Ferguson, Kraeer, and Welty, Robert F., S. Clin. North America, December, 1947.)

tient. In the gut you see these inflammatory masses which are often mistaken at operation for carcinoma. Such a gut has to come out.

Carcinoma occurs in a fair percentage of cases of colitis, especially in colitis of long-standing. Dr. Richard B. Cattell from his series believes that in those cases with ulcerative colitis of ten years or more, approximately 30 per cent develop carcinoma. Our experience has not been as great as his nor has our number of cases been as great, but we have had 3 or 4 patients with long-standing colitis who have developed carcinoma.

Figure 10 shows a defect in the cecum, which proved to be a definite carcinoma in a long-standing case of ulcerative colitis.

I might add that the development of carcinoma in ulcerative colitis bears a very poor prognosis. These patients are almost never able to be resected and cured, and the fact that carcinoma does appear in these long-standing cases of ulcerative colitis makes it imperative that the colon should be constantly under observation, and frequently studied, because of this danger.

Fistulas and sinuses occur in ulcerative colitis not too infrequently. In Figure 11 you see three fistulous tracts in a long-standing case of ulcerative colitis. These represent chronic perforations with secondary abscesses, and in such cases nothing less than removal of the colon is going to cure the patient.

FIGURE 11. X-ray of patient with ulcerative colitis of four years' duration showing a marked constriction of the bowel which takes place in these cases, and three fistulous tracts which represent chronic perforations of the gut. The one in the descending colon proved to lead into a large abscess.

Finally, patients who have had an ileostomy who develop arthritis or other signs of toxic absorption from the diseased gut are certainly candidates for removal of the colon.

WHAT should be done when we operate for ulcerative colitis? Our principle is first to divert the fecal stream at the most distal portion of normal gut. Thus, in a left-sided colitis we do a transverse colostomy; in a right-sided colitis, an ileostomy is necessary; if the sigmoid escapes we may do an ileosigmoidostomy.

Having diverted the fecal stream, the patient is allowed to recover, and the recovery is remarkable. The patients gain weight, return to their normal nutritional status, and then comes the decision as to whether or not the colon should be removed. I have already given you the indications for colectomy. Our feeling is that most colons should be removed once an ileostomy is performed.

The colectomy is usually done in stages: a subtotal colectomy around to the sigmoid; then if the patient continues to have difficulty, an abdominoperineal resection is performed. The

TABLE 1

SURGICAL PROCEDURE	NUMBER	SURGICAL PROCEDURES FOR COMPLICATIONS	NUMBER
Ileostomy	22	Obstruction	7
Colectomy	21	Abscess	3
Abdomino-perineal	12	Prolapse ileostomy	3
Ileostomy and subtotal colectomy	7	Wound rupture	1
Colostomy	8	Perforation terminal ileum with peritonitis	1
Ileocolostomy	7	Phlebothrombosis with superficial femoral ligation	1
Resection colon and anastomosis	1		16
Vagotomy	1		
Re-anastomosis (ileosigmoidostomy)	1		
	80		

TOTAL SURGICAL PROCEDURES 96

TABLE 2

PERCENTAGE OF THOSE LIVING HAVING DISEASED BOWEL REMAINING

ALL DISEASED BOWEL REMOVED	ALL DISEASED BOWEL OUT BUT RECTUM AND RECTOSIGMOID	ALL DISEASED BOWEL IN
24 (60 per cent)	16 (27.5 per cent)	5 (12.5 per cent)

TABLE 3

RESULTS OF SURGICAL TREATMENT OF ULCERATIVE COLITIS—44 CASES

	NUMBER	PER CENT
Operative deaths	2	4.6
Death from secondary carcinoma	2	4.6
Excellent result	34	77.2
Good result	4	9.0
Poor result	2	4.6

stage procedure gives a patient who is in good nutritional status throughout a not too shocking procedure, as you will see from results of the operation.

In a few cases a primary ileosigmoidostomy may be performed if the sigmoid is not involved, or a secondary ileosigmoidostomy may be performed if the distal gut recovers after a period of fecal diversion by ileostomy.

Our series consists of 44 patients with 96 surgical procedures (Table 1). In that group, 22 have ileostomies, and of those 22 ileostomies, 21 had colectomies, and so on.

Of all of our 44 cases, 24, or 60 per cent, have had all of their gut removed; 16 have had all but their rectosigmoid removed, and in only 5 cases is the colon remaining (Table 2).

What sort of results can we expect in these cases with colitis? In the first place, the mortality from surgery in these cases is low (Table 3). We have had 2 operative deaths, both of them from ileostomy; no deaths at all from any of the more extensive colectomies that were performed; 2 deaths in 44 cases, or 4.6 per cent mortality. There were 3 cases of carcinoma appearing, so that this danger is a constant one.

Of the remaining cases, 34 of them, or 77.2 per cent, are living what we consider to be normal lives as exemplified by the patients we have presented. Four of them are not quite well. These are cases who do not have their colons out, who have simply ileostomies, and who are

FIGURE 12. Before and after picture. (A) Patient three weeks after ileostomy and partial colectomy. (B) One year later.

(Reproduced from: "An Appraisal of the Medical Versus the Surgical Treatment of Idiopathic Ulcerative Colitis," by Ferguson, Kraeer, and Elsom, Kendall A., Am. J. M. Sc., July, 1941.)

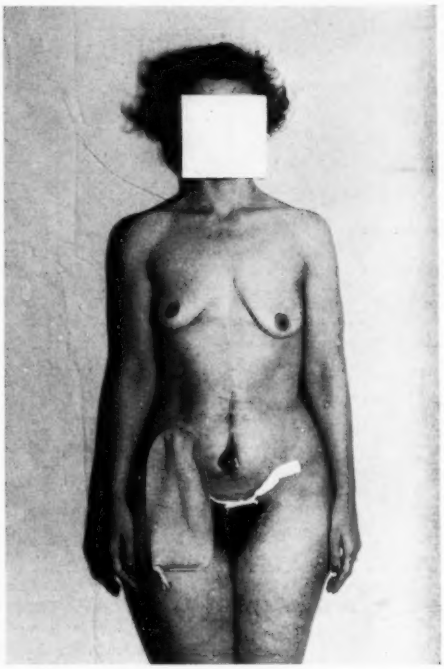


FIGURE 13. Patient wearing a Rutzen bag. Patient has had an ileostomy and a subtotal colectomy. The sigmoid is implanted in the midline. The bag is cemented to the skin around the ileostomy and can be worn without disability to the patient.

still having some discharge and bleeding from their diseased colons. Two of them have a poor result. We consider the results poor because they are not well. One had a vagotomy; the other case is a patient who still has an unhealed perineal wound following a complete colectomy.

With surgery in these cases, one can expect the following things:

(1) A change of personality: these patients, who are previously complaining, irritable, unstable emotionally, change to patients who are pleasant, happy, productive, who live perfectly normal lives. The ileostomy does not appear to be too great an inconvenience. Three of our patients have married; others are contemplating marriage; one of my patients has had a child since her colectomy and ileostomy.

(2) They all gain weight and return to their normal nutritional status as compared to the previous status with colitis.

(3) The mortality is minimal in comparison to the seriousness of the disease.

Figure 12 shows a patient who weighed about 70 pounds at the time of her operation. The photograph on the right is taken a year later. This patient with her ileostomy worked in a music store. She later married, and now has a child, in spite of her ileostomy. I show her simply to illustrate that the patient with ulcerative colitis treated surgically is not a handicapped individual.

ONE of the chief reasons these patients can live such normal lives, I think, should be mentioned, and that is the Kernig-Rutzen bag (Figure 13). Great credit should be given to the people who manufacture these bags, because these can be cemented to the abdominal wall at the site of the ileostomy; there is no leakage, no drainage, no excoriation of the skin, and the patients are able to take care of themselves without too much inconvenience. These bags are ever so much better than any other type of bag.

Scientific Exhibit

Sublingual or Buccal Administration of Steroidal Hormones

CLINICAL APPLICATIONS

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Endocrine Clinic of the Division of Medicine, University of California, School of Medicine, San Francisco

THE sublingual or buccal route for administration of steroids is currently accepted as a reliable and efficacious mode of treating certain clinical conditions. The value of this method is attested by its increasingly wide-spread adoption.

It is now established that the usefulness of the steroids is no longer confined to replacement therapy for specific hormonal deficiencies. Day by day, diverse and unsuspected conditions are discovered, often totally unrelated to any endocrine disorder, for which steroid therapy proves surprisingly beneficial.

For example, the use of methyl testosterone is not confined to testicular deficiency where it is employed for its androgenic properties. It is also helpful for controlling symptoms of the female menopause, mastodynia, some metrorrhagias, and inoperable cancer of the breast. But more suitable for quantitation are the objective anabolic effects of methyl testosterone as manifested by growth in height and gain of weight. Likewise, desoxycorticosterone acetate is not only potent for the adequate maintenance of patients with Addison's disease but also has been found to possess anticonvulsive properties and, in all likelihood, will be found to have still other useful applications.

Most steroids in practical doses are either relatively or totally inert when swallowed because they are, to a considerable degree, inactivated by the liver in the course of absorption through the portal circulation. This loss of potency when the compound is swallowed can be circumvented by other technics of administration, e.g., inunction, intramuscular injection, pellet implantation, vaginal suppositories, and recourse to absorption through the buccal mucous membranes. All these methods have merit, and, in certain circumstances, one procedure may be preferable to another.

During the past ten years, in our hands the sublingual method has proved eminently satisfactory, and we prefer it for the following reasons:

A. *Advantages to the Patient*

1. Avoids frequent office visits for injections, saving considerable time and possible discomfort.
2. Less expensive than any other method.
3. More convenient than any other method (except in the cases of methyl testosterone and anhydrohydroxyprogesterone which are effective when swallowed but require 2 to 4 times the sublingual dose).

B. *Advantages to the Physician*

1. Dosage is easily adjusted and controlled.
2. Reduces office load on busy practicing physician. (Pellet implantation also reduces office load and works well in experienced hands but is not without hazard for general use.)
3. Promotes good feeling between patient and physician by reducing the much-criticized high cost of medical care.

Sublingual Therapy

HISTORICAL

1. The sublingual route—an old, well-recognized method of administering drugs, e.g., nitroglycerin (1870),* morphine, atropine, etc.
2. Steroids have been successfully administered by this route. Anderson et al,** working at the University of California Hospital (1939), showed that patients with Addison's disease could be maintained in good health with desoxycorticosterone acetate dissolved in propylene glycol administered sublingually. The same compound when swallowed is inert.
3. Today steroids are put up in more convenient form: hard compressed tablets to be placed under the tongue or in the buccal pouch for direct absorption through the mucous membrane.

TECHNIC OF ADMINISTRATION

Absorption time, approximately 30 minutes. Tablet is placed under tongue.

Patient instructed not to eat, drink, talk, smoke, chew, or in any way hasten tablet disintegration.

Absorption time 45-60 minutes.

Tablet placed in buccal pouch requires longer time for absorption but talking may be allowed.

Sublingual route preferable for patients wearing lower dentures. Advise administration when reading, listening to radio, watching television, commuting, etc., but not on retiring because tablet might slip into larynx during sleep.

WHY AND HOW IT WORKS

Sublingual vascularity

Systemic vs. Portal circulation.

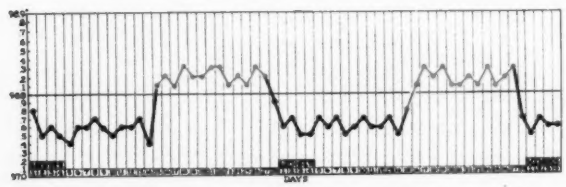
The liver inactivates steroids to a considerable degree. Sublingual or buccal absorption provides direct access to systemic circulation by short-circuiting the liver.

Sublingual Administration of Progestins

PROGESTERONE AND ANHYDROHYDROXYPROGESTERONE

IN CASES OF AMENORRHEA

1. Normal basal body temperature chart taken each morning at same hour upon arising.

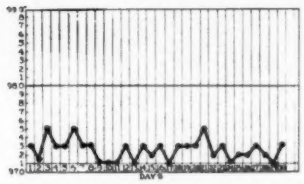


NOTE: Characteristic rise of at least 0.6° F. at or about time of ovulation and fall in temperature at time of menses.

*SIR ROBERT LAUDER BRUNTON: Pharmacology and Therapeutics, Lectures, 1877.

**EVELYN ANDERSON, W. HAYMAKER AND E. HENDERSON: J.A.M.A. 115:2167 (1940).

2. Production of withdrawal menses with sublingual progesterone.

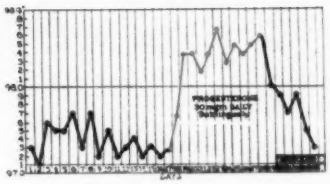


Female, age 21.

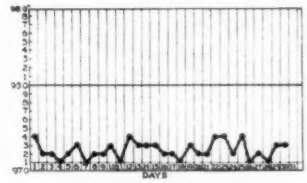
Secondary amenorrhea of 30 months' duration.

Note absence of cyclic activity

With progesterone.



3. Effect of sublingual anhydrobydroxyprogesterone on basal body temperature.



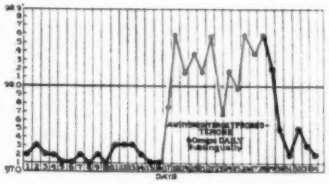
Female, age 30

Primary amenorrhea.

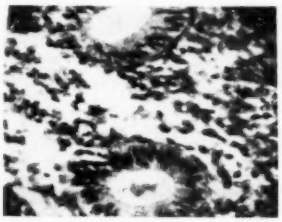
Diagnosis: Congenital ovarian aplasia.

NOTE absence of any cyclic ovarian activity without therapy.

With anhydrohydroxyprogesterone.



4. Production of Secretory Endometrium with sublingual progestins.



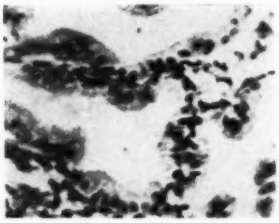
Female, age 32.

Primary amenorrhea.

Diagnosis: Congenital ovarian aplasia.

Endometrial biopsy after 23 days of estrin therapy.

Endometrial biopsy 12 days after addition of sublingual anhydrohydroxyprogesterone (60 mg. daily).



5. Objective evidence of efficacy of sublingually administered progestins:

a. Elevation of basal body temperature, withdrawal menses and secretory endometrium.

b. Economy-dosage used less than amount required if swallowed.

c. Ease of administration.

6. Indications:

a. Control of bleeding in metropathia hemorrhagica (menometrorrhagia).

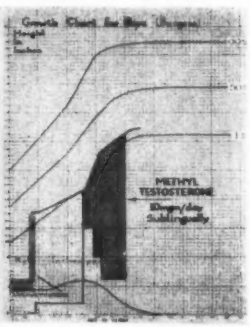
b. Production of withdrawal menses if endometrium has been primed by estrin.

c. Threatened or habitual abortion.

d. Has been advocated for premenstrual tension and mastodynia.

SUBLINGUAL ADMINISTRATION OF TESTOSTERONE COMPOUNDS

For Growth: Methyl Testosterone Administered Sublingually or via the Buccal Mucosa to Short Slender Sexually Retarded Boys



Grew 7 inches
Gained 31 pounds } *in 2 years*

Age: 14 yrs., 1 mo. Bone age: 10 yrs.

Age: 15 yrs., 1 mo. Bone age: 12 yrs.

Age: 16 yrs., 1 mo.

1. Equally good results in all of 56 cases.
2. Rapid increase in height, averaging four inches first year of therapy.
3. Impressive gain of weight, strength, and musculature.
4. Prompt growth of sexual hair and genitalia, also deepening of voice.
5. Concomitant bolstering of morale and self-confidence, thus correcting feelings of inferiority and embarrassment and avoiding any psychic trauma.
6. Bone age does not advance beyond chronologic age; epiphyseal closure is not precipitated.
7. Spermatogenesis is not affected adversely; actual stimulation in some instances.
8. Gynecomastia constitutes a rare complication (2 cases). Tender nipples demand interruption of treatment, reduction of dosage if resumed, sometimes cessation of testosterone therapy.
9. Dosage must be adjusted individually to avoid too frequent or prolonged erections.
10. Average initial dose—10 to 20 mg. per day, sublingually. Average maintenance dose—5 to 10 mg. per day, sublingually.
11. When sexual status corresponds to chronologic age, treatment should be discontinued; nature may carry on from there. Therapy in the case of short sexually retarded boys is stimulatory, rather than substitutional, hence need not be continued indefinitely.

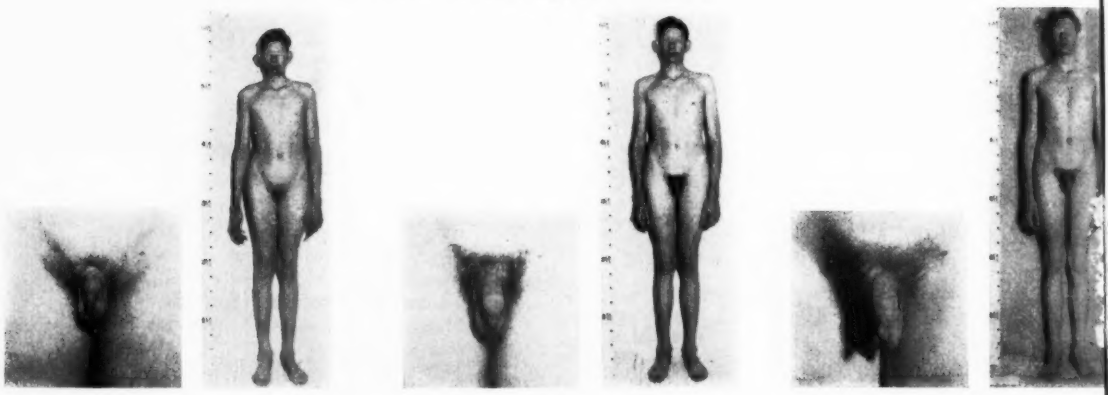
SUBLINGUAL ADMINISTRATION OF TESTOSTERONE COMPOUNDS

To Produce Androgenic Effects in Male Hypogonadism

I. PRIMARY TESTICULAR EUNUCHOIDISM OR EUNUCHISM

Primary Testicular Pre-adolescent Eunuchoidism

Age: 19. 17-ketosteroid—9.5 mg. per day. FSH excretion normal (positive at 6 mouse units and negative at 18 units).



March, 1946 *April, 1947* *March, 1948*

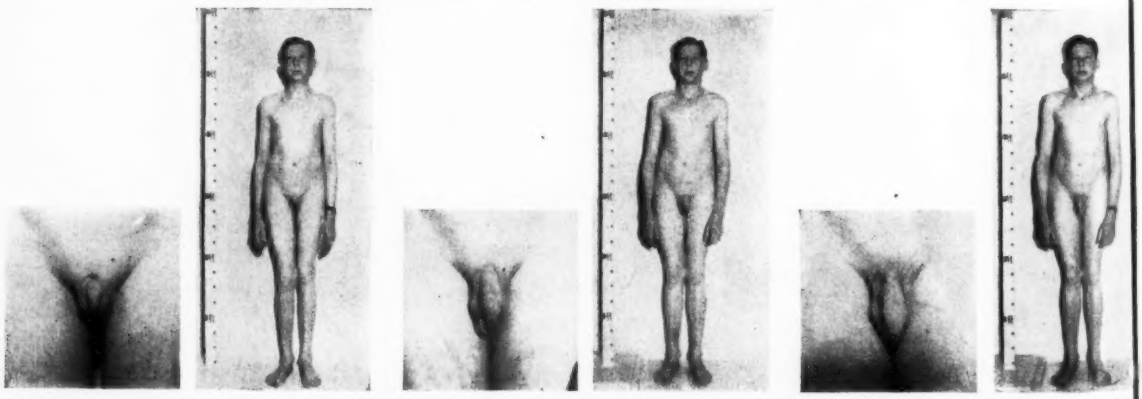
Methyl testosterone: 10 mg. and 5 mg. per day sublingually after 20 mg. caused priapism. Note genital and somatic development and maturity of facial expression.

II. MALE HYPOGONADISM SECONDARY TO HYPOPITUITARISM

(Simmonds' Disease, Hypophyseal Infantilism, Hypophyseal Eunuchoidism)

Eunuchoidism secondary to lack of pituitary gonadotrophins associated with a tumor of the Pituitary Gland.

Age: 34. 17-ketosteroid—3.8 mg. per day. FSH absent at 3 mouse units.



May, 1946
Appearance before treatment

October, 1946
After 5 months treatment with 20 mg. daily of methyl testosterone sublingually. Note genital and muscular development.

May, 1947
After year of sublingual therapy. Note further development and appearance of pubic hair.

III. GENITAL RETARDATION, DELAYED PUBERTY

Age 17. 17-ketosteroid—7.5 mg. per day. FSH border line at 5 mouse units.

July, 1948
Before treatment.

March, 1950
After 20 months' treatment with 10-15 mg. per day of methyl testosterone sublingually. Note genital and somatic development obtained.

COMPARATIVE EFFICACY OF TESTOSTERONE COMPOUNDS GIVEN SUBLINGUALLY IN VARIOUS BASES TO TWELVE HYPOGONADAL MEN

These tablets were designed for absorption through the buccal mucosa. No difference was found between effects produced in the buccal pouch or sublingual cavity.

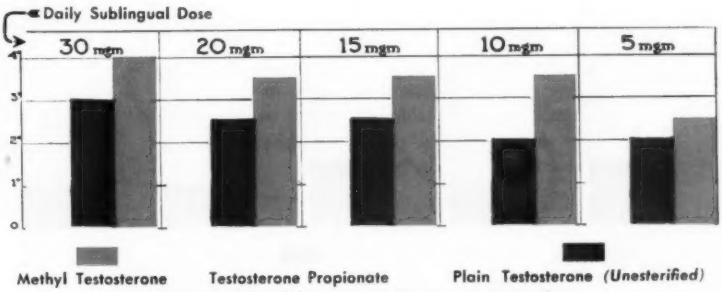
4+ *Excessive Effect*—Priapism, more than three erections per day, or edema.

3+ *Full Effect*—Growth of genitalia, one to three erections per day, increase in facial, pubic and axillary hair, normal capacity for ejaculation, deepening of voice, acne, increase and maintenance of weight.

2+ *Moderate Effect*—Less than full effect, with three to seven erections per week.

1+ *Slight Effect*—Less than moderate effect with less than three erections per week.

0 *No Effect.*



No salivation produced from any of the above compounds.

SUBLINGUAL ADMINISTRATION OF TESTOSTERONE COMPOUNDS FOR WEIGHT GAIN

Sublingually administered testosterone compounds stimulate the formulation of body tissue in general and have been used experimentally at the University of California Out Patient Department (Endocrine Clinic, Arthritis Clinic, Chest Clinic, Neurology Clinic, and Breast Cancer Clinic) for control of tissue loss in various wasting diseases.

1. Satisfactory weight gain has been produced with SUBLINGUAL METHYL TESTOSTERONE *in debilitating diseases which are otherwise not specially ameliorated by this treatment.*

Rheumatoid arthritis	Dose of methyl testosterone
Bronchiectasis	Females: 5 to 10 mg. per day sublingually
Disseminated lupus erythematosus	Males: 10 to 40 mg. per day sublingually
Pulmonary tuberculosis	

II. Weight gain is also produced with *sublingual methyl testosterone* in conditions which may be specifically improved with this therapy.

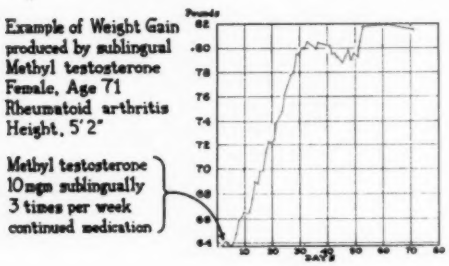
Inoperable cancer of the breast: relief of pain from bony metastases, feeling of well-being, occasional regression of soft tissue or bony metastases, as well as weight gain. Dose: 40 mg. per day sublingually.

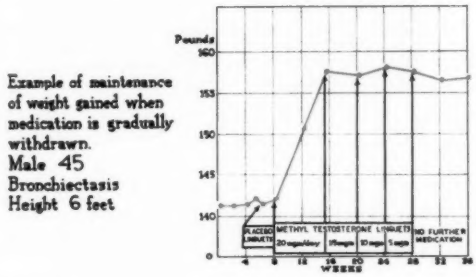
Hypophyseal cachexia: amelioration of cachexia, improvement of decreased metabolic rate, increased libido, growth of sexual hair, and relief of secondary hypogonadism in the male. Dose: 5 to 20 mg. per day sublingually.

Cushing's syndrome: improvement in osteoporosis, muscular wasting, protein loss and secondary hypogonadism. Dose: 10 to 40 mg. per day sublingually.

Postmenopausal osteoporosis: relief of pain and invalidism, abolition of hypercalciuria. Similar results have been produced in Paget's disease of bone. Dose: 10 to 20 mg. per day sublingually.

III. Weight gain and decrease in creatinuria have been inconstantly produced in neuromuscular wasting diseases treated with sublingual unesterified testosterone 40 mg. per day.


Example of Weight Gain produced by sublingual Methyl testosterone
Female, Age 71
Rheumatoid arthritis
Height, 5'2"
Methyl testosterone 10mgm sublingually 3 times per week continued medication
Pounds
DAYS



MAJOR CONSIDERATIONS

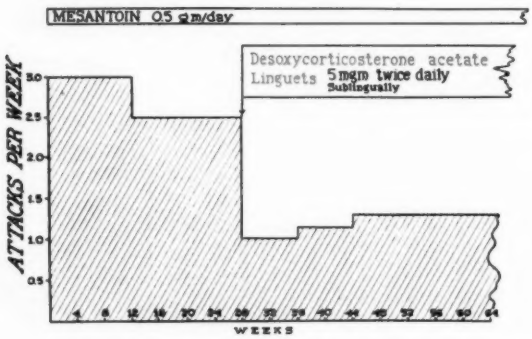
1. Metabolic balance studies in 5 patients have shown that the weight gained with these doses consists of protein tissue and not of edema or fat. (Studies conducted at the Laboratory of Experimental Oncology.)
2. The dose must be adjusted for each individual. It is particularly desirable in women to use the smallest dose which will produce weight gain but not masculinization or hyperlibido.
3. Amount of weight gained varied from 11 to 22 pounds. When maximal weight gain is achieved, the weight is usually retained after the amount of the agent is gradually reduced and then withdrawn.
4. The treatment may be continued in conditions where it constitutes substitutional therapy, e.g., hypophyseal cachexia, or where continued treatment is otherwise indicated, e.g., inoperable cancer of the breast.

SUBLINGUAL ADMINISTRATION OF DESOXYCORTICOSTERONE ACETATE (DCA)

For the Control of Convulsive Seizures

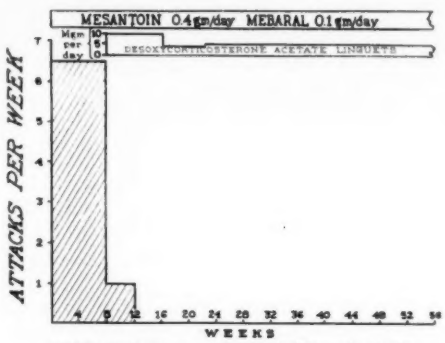
In patients whose seizures were not controlled by usual therapy and whose attacks occurred with reasonably constant frequency.

CASE 1. Female, age 23, post-traumatic convulsive seizures.



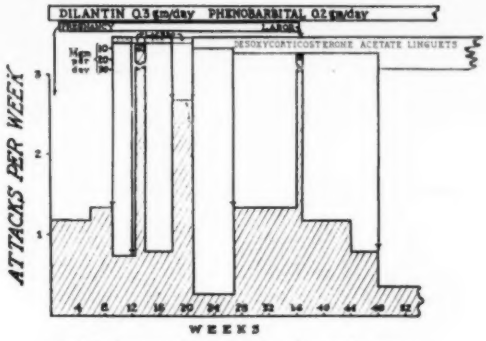
***NOTE:** Reduction in frequency of seizures after addition of desoxycorticosterone acetate linguets 10 mg. per day, sublingually.*

CASE 2. Female, age 15, idiopathic convulsive seizures.



NOTE: Reduction and later abolition of attacks after addition of desoxycorticosterone acetate linguets 4 to 10 mg. per day sublingually.

CASE 3. Female, age 22, idiopathic convulsive seizures plus pregnancy.



NOTE: Decreased frequency of attacks upon addition of desoxycorticosterone acetate linguets 4 to 30 mg. per day, sublingually and exacerbation when placebo linguets were substituted.

MAJOR CONSIDERATIONS

1. Similar results in 9 of 11 cases. Patients previously uncontrolled on dehydration, acidosis, sedation, and other anticonvulsive drugs.
2. Patients have not shown hypertension or retention of salt and water (gain of weight or edema) during two and a half years of observation on this therapy.
3. Present limited data suggest that desoxycorticosterone acetate linguets may be of greatest value in petit mal, less in grand mal, doubtful in Jacksonian epilepsy.

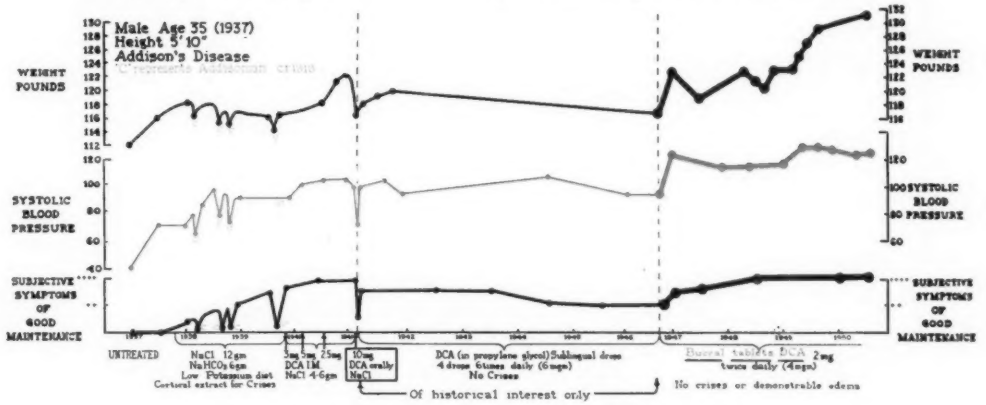
SUBLINGUAL ADMINISTRATION OF DESOXYCORTICOSTERONE ACETATE (DCA)

In Addison's Disease, DCA is Effective Therapy for Maintenance

(Not for crises)

Sublingual therapy meets the clinical criteria for maintenance:

1. A sense of well-being.
2. Good appetite and digestion.
3. Ability to carry on gainful occupation.
4. Normal weight and blood pressure levels.



IMPORTANT CONSIDERATIONS

All patients with Addison's disease seen in this clinic since 1946 have been maintained on DCA buccal tablets.

1. DCA is ineffective if swallowed.
2. A 2 mg. tablet twice daily is more effective than a 4 mg. tablet once daily.
3. Easy self-administration of hormone makes for excellent patient cooperation, diminishing the hazards from crises.
4. Buccal tablets of DCA eliminate bother and expense of daily injections or of pellet implantation.
5. Over- or under-dosage is readily adjusted.
6. No supplemental salt is needed.
7. Sublingual dosage of DCA compares favorably with intramuscular dosage.

The average intramuscular dose of DCA is 3.8 mg. daily when 3 to 4 gm. of salt are supplemented (Thorn, Dorrance, and Day, 1942).

In 13 cases treated in our clinic, the average daily dose of buccal tablets of DCA was 4.8 mg. In 9 of these the dose was two 2 mg. tablets daily (4 mg.).

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The original panels of this exhibit were prepared by Will Symmes, Shirley Baty and Bess Bonner of the Medical Illustration Department, University of California, under the direction of Ralph Sweet.

CLINICAL STUDY

Oral Administration of Chlorophyll Fractions for Body Deodorization

ROYAL M. MONTGOMERY AND HENRY B. NACHTIGALL

NEW YORK CITY

The use of water-soluble derivatives of chlorophyll for medical purposes has in the past been confined to local external application. The studies of the uses of these chlorophyll fractions have been directed mostly toward their tissue-stimulating properties. Recent studies of the value of chlorophyll fractions in wound healing have also included results of deodorant effects. In 1949 Moss[1] and others found that chlorophyll was a consistently effective deodorant when used on foul-smelling wounds.

In 1950 Westcott[2] demonstrated that specially prepared fractions of water-soluble chlorophyll A were nontoxic for humans when administered orally. In vitro and in vivo experiments by Westcott showed definite neutralization of malodorous substances and obnoxious body odors.

To study further the effectiveness of specially prepared chlorophyllins a wide variety of subjects were chosen under varying conditions of activity and states of health.

A group of 25 employees from a large metropolitan industrial plant was selected to represent the usual activity of a working person. A second group of 20 college athletes from a large university was selected for the study of perspiration odors of young persons after vigorous exercises. A third group of selected cases was chosen to demonstrate odors due to various illnesses.

METHOD OF MEASUREMENT

Underarm odor was selected for this study since it is easily accessible for testing and is a commonly accepted area associated with objectionable body odor. The testing of odors was done by physicians using the Fair-Wells metal osmoscope.

The intensity of the odor which employs the air dilution method is determined by the figures on the side of the osmoscope. They represent the p0 values. If no odor is noticeable in 6 position, but odor can be detected in the 5 position, the p0 value is 5. If no odor can be detected in the 1 position, but odor can be sensed in the 0 position, the p0 is 0. The concentration of odor producing constituents for a p0 reading of 5 is 32 (2^5 equals 32); for a p0 reading of 0 it is 1 (2^0 equals 1). If no odor is detectable in the 0 position, the substance is odorless and has no p0 or odor intensity.

Thus the actual readings can be done starting at 0 which means 100 per cent of air coming from the test area or at 6 which means the strongest dilution of odor possible with air coming in through the side holes. Readings for underarm odor were obtained by putting the distal end of the osmoscope directly in the armpit with the subject's arm held at about 45° with the hand on the hip. This made an effective cup, preventing normal air from entering the mouth of the osmoscope. Customary hygienic habits were to be continued by each individual with only one stipulation—that a plain white unscented soap be used for washing and bathing. Clean underclothes were requested for each testing period so that no accumulated underarm odor would be carried by the undergarments.

DEODORANT STUDIES ON THE INDUSTRIAL GROUP

Twenty-five people from two classes of workers were selected. Fifteen in the first section were men classified as semi-skilled and manual workers. Their occupation required considerable physical activity with resultant frequent

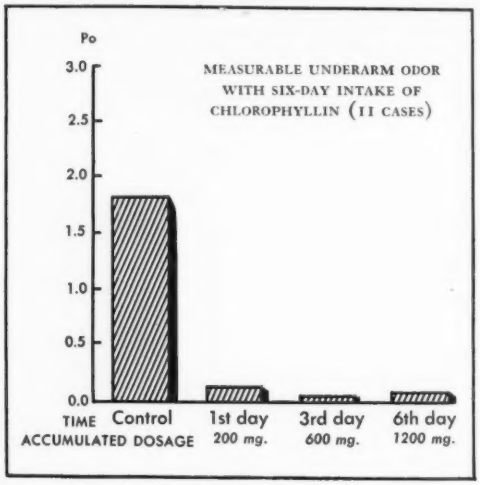

FIGURE 1

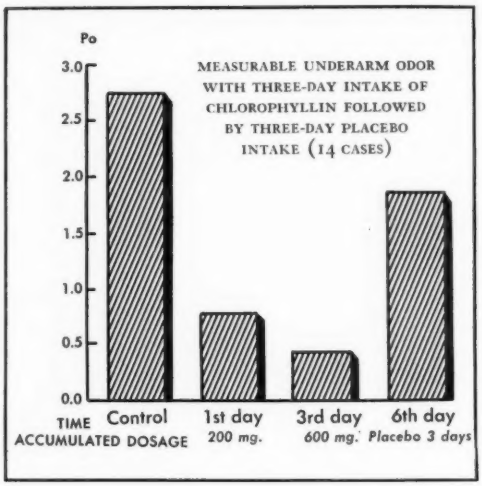

FIGURE 2

and profuse perspiration. The second section consisted of 10 women classified as secretarial and light semi-skilled employees. Their occupation required average physical activity with ordinary anticipated perspiration.

At noon on the first day of testing a control reading of underarm odor was obtained. The average reading for the 25 employees was 2.3. Two 100 mg. tablets of chlorophyllins were given to each individual, one to be taken before retiring, and the other after breakfast on the next day. At noon on the second day the average reading for the entire group was 0.5. This represented an approximate 30 per cent drop in measurable underarm odor following the ingestion of 200 mg. of chlorophyllins in 24 hours. The dose was doubled for the next day with two 100 mg. tablets to be taken at night and two after breakfast the next day. At noon of the third day the average reading for the entire group was 0.2. This represented a 91 per cent decrease in measurable underarm odor for an accumulated dose of 600 mg. chlorophyllins in 48 hours.

Following this noon reading the distribution of tablets was altered without the knowledge of the testing group. Eleven individuals were given six 100 mg. chlorophyllin tablets, while the remaining 14 employees were given six placebo tablets. The routine method of ingestion was unchanged, one tablet at night with one tablet after breakfast the next day. This was sufficient for three days. At noon of the sixth day readings were taken of the two groups. Group one of 11 subjects (Figure 1) with an accumulated dose of 1,200 mg. chlorophyllins in 144 hours, showed practically a total reduction of underarm odor—too faint for actual measure. Group two of 14 subjects (Figure 2) who started with a 48-hour administration of chlorophyllins, but then were placed on a three-day placebo replacement showed an average reading of 1.8, or a 75 per cent return of the original degree of measurable underarm odor. The 72-hour period of placebo intake was estimated as being sufficient for elimination of the previously ingested 600 mg. of chlorophyllins by members in this group.

Several subjects volunteered comments made by close members of their families with reference to general body odor. Although subjective in nature it was interesting that these comments indicated that a definite degree of body odor change was discernible by family members. One employee, a porter, quoted his wife as stating that he "does not smell anymore," after the first days of the test. However, he expressed disappointment toward the end of the period because of the return of body odor, not being aware of his inclusion in the group placed upon placebo tablets for three days. A similar comment was made by another manual worker who

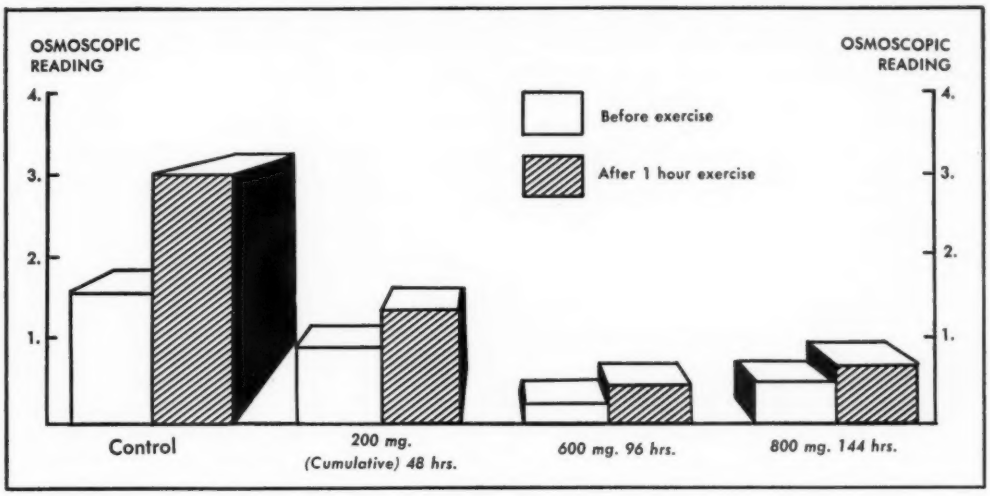

FIGURE 3. Measurable underarm odor before and after exercise using oral chlorophyllins in 20 athletes.

also had received placebo substitution—he expressed disappointment that the tablets had "failed" at the end of the testing period.

DEODORANT STUDIES ON ATHLETES

The purpose of this study is to determine the effectiveness of the specially prepared chlorophyllins on the underarm perspiration odors of young persons after vigorous exercises.

A group of 20 college basketball players were tested by two physicians using the Fair-Wells metal osmoscope. Control tests were done for the normal p0 readings at 2:00 P.M. after their usual classroom work, and a second reading done immediately after at least one hour of strenuous basketball practice. All the subjects were perspiring profusely at the second reading. About 20 readings were done on each subject during the study.

After taking their normal p0, which was used as the control, each athlete was instructed to shower, using plain white soap (unscented), and to wear clean underclothes for each two-day testing period. They were given clean gym suits at the beginning of each two-day test, to avoid accumulated perspiration odors.

For the first two days each student took a 100 mg. tablet of chlorophyllins at breakfast. At 2:00 P.M. on the second day the osmoscopic tests were repeated. Readings for these tests were obtained, as previously described, from the armpits. After one hour of strenuous exercise the readings were taken again.

On the third and fourth days the dosage was increased to 200 mg. of chlorophyllins. At breakfast 100 mg. were taken and the other 100 mg. at noon. For the 96-hour period the accumulated dose was 600 mg. The dosage was reduced on the fifth and sixth days to 100 mg. taken at breakfast. The accumulated dose for the six-day testing period was 800 mg.

The average reading for the 20 athletes (Figure 3) before the ingestion of specially prepared chlorophyllins was 1.5. Following one hour of strenuous exercise this reading rose to 3.0. After 48 hours of medication the osmoscopic reading was 0.9 before exercise, a 40 per cent decrease in measurable underarm odor. Following one hour of basketball practice the osmoscopic reading was 1.2, a decrease of 60 per cent from the control reading of 3.

After 96 hours of medication with the accumulated dosage of 600 mg. of chlorophyllins the reading before exercise was 0.15 and that taken after exercise was 0.3. Both were reduced 90 per cent as compared to the controls.

The readings taken 144 hours after the ingestion of a total of 800 mg. of chlorophyllins showed that the decrease in measurable underarm odor before exercise was 76 per cent and after exercise was 83 per cent. The p0 readings were 0.36 and 0.5 respectively.

The subjective opinions of these 20 college athletes were volunteered as follows, on written questionnaires: 100 per cent noticed a decrease in the odor of perspiration on their bodies when taking the chlorophyllins throughout the above tests, and 80 per cent noticed less perspiration odor on their street clothes.

To further prove the effectiveness of this specially prepared chlorophyllin, the basketball players were divided into three groups for a two-day test. Group 1 was given 200 mg. daily of raw chlorophyll; group 2 was given 200 mg. daily of a copper salt of chlorophyll and group 3 was given nothing.

TABLE 1

Osmoscopic Readings After 48 Hour Test

	BEFORE EXERCISE	AFTER EXERCISE
Group 1		
400 mg. untreated chlorophyll (5 students)	1.13	1.3
Group 2		
400 mg. copper chlorophyll (5 students)	0.5	1.0
Group 3		
no chlorophyll (10 students)	0.8	1.13

Table 1 shows a greater increase of measurable underarm odor following the use for 48 hours of untreated chlorophyll, copper chlorophyll and no chlorophyll. This test followed a six-day period of medication with the specially prepared chlorophyll.

The specially prepared chlorophyllins effectively reduced the underarm odor before and after vigorous basketball exercise in the 20 college students tested using 200 mg. daily. A reduction of the intake of chlorophyllins to 100 mg. daily on the fifth and sixth days instead of 200 mg. resulted in a slight increase of measurable body odor.

DEODORANT STUDIES ON DISEASES

In this third group only a few cases have been observed to date but the results are encouraging enough to report. Osmoscopic readings were not made but the word or olfactory sense of the physician or nurse caring for the patient was accepted as evidence.

A total of 9 cases was given the specially prepared chlorophyllin for one week or more, 100 mg. three times daily. The cases included one hemiplegic with a large varicose ulcer; an 83-year-old female hemiplegic with large decubitus ulcers and incontinence of urine; a Negro with chronic nephritis; a woman with a large necrotic radiation ulcer on her knee; a woman with gangrene of the toe; a man with chronic hepatitis and a 74-year-old lady with hemiplegia and inoperable cancer. A physiotherapist who had a body odor following daily exercise was also included. The odors were all greatly decreased except in the case of the radiation ulcer.

CASE REPORT

A white female, age 33, was first seen because of extreme anxiety and depression which seemed to be worse before and during her menstrual cycles. It was immediately and grossly evident to the entire office staff that a repulsive body odor was present when she visited us the few days before and during her menstrual flow; the odor was not noticeable during the intermenstrual period. Her bathing custom was unchanged and her clothes were clean at all times. Without her knowing what the tablets were actually for, she was given 100 mg. of chlorophyllin and advised to take one tablet daily but to increase to 2 tablets daily a week before and 3 tablets daily during the menstrual flow. On subsequent visits we were able to control the obnoxious odor at will by the use of chlorophyllins and this result was confirmed by unsolicited reports from her husband. An acutely inflamed chronic appendix was removed and contrary to our anticipation there was no decrease in the body odor as a result of the removal of a chronically diseased viscus. Numerous other cases of a similar but less spectacular type have been observed with a high percentage of relief from this troublesome social handicap.

CONCLUSIONS

1. Specially prepared chlorophyllins prepared by the Westcott method when given in the dosage of 200 mg. daily effectively reduce the measurable underarm odor both in industrial workers and in college athletes.

2. The results were encouraging in reducing the odors from pathologic conditions. A large dose of 300 mg. daily is necessary.

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Pediatrics

IN GENERAL PRACTICE

For general practitioners, in whose practice is included a major proportion of the medical management of infants and children, and for the specializing pediatrician as well, POSTGRADUATE MEDICINE *presents this special regular department devoted to brief discussions by recognized authorities on their preferred methods of the treatment and management of diseases and problems of infancy and childhood.*

Progress in the Care of Crippled Children

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PROGRESS in the care of crippled children has been made more slowly during the past decade than in some other fields of medicine. Nevertheless, some diseases, such as osteomyelitis, which originally caused large numbers of cripples each year, have been controlled and the deforming and crippling effects almost completely abolished through the use of sulfonamides, penicillin, and streptomycin.

Tuberculosis, which crippled more children than any other single disease during the nineteenth century and for the first 10 to 15 years of the twentieth century, has become comparatively rare because of the elimination of dairy herds infected with tuberculosis and the better isolation in sanatoria of human carriers of pulmonary tuberculosis.

Rickets, which for generations prior to about 1920 affected a vast proportion of the infant population, with resulting deformities, has been conquered through better diets and supplements of vitamin D in various forms. The most recent advance in the control of crippling by correction of nutritional deficiencies has been the observation made by Relton McCarroll of St. Louis and William Green of Boston, that the dyschondroplasia previously thought to be the result of primary germ cell defects is in reality a vitamin D resistant type of rickets. The tendency to be vitamin D resistant or the inability to utilize this vitamin in the amounts normally present in foods is hereditary. By the administration of massive doses of vitamin D, varying from 100,000 to 500,000 units daily, dyschondroplasia in infancy or childhood has been noted to heal with continued growth of the bones. Deformities so characteristic of this condition, previously thought to be beyond the realm of therapy, are minimized if the high vitamin D therapy is maintained.

Very simple and atraumatic principles of treatment, such as the Denis-Browne splint in the care of club feet; the reverse Denis-Browne splint in the treatment of pes valgus or pes valgoplanus; and the Frejka splint in the treatment of congenital inadequacy or congenital dislocation of the hips in early infancy, have greatly improved the end results. The wide spreader splint, built on the principle of the Denis-Browne splint, but with a bar which produces complete abduction of the hips, permitting flexion and extension motions while maintaining reduction, has been most effective in obtaining stable hips with normal-appearing acetabula and normal function.

The recognition of eosinophilic granuloma as a

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specific clinical entity which often heals spontaneously, is cured by local excision or curettage, and which may be healed in most instances within a relatively short period of time by x-ray therapy, has resulted in sparing patients affected by this disease mutilation and unnecessary surgery. When the diagnosis is correctly made the physician may give full reassurance that the disease can be cured.

We will briefly describe the progress which has been made in the treatment of club feet, congenital dislocation of the hip, hematogenous osteomyelitis, and the diagnosis and treatment of eosinophilic granuloma.

CONGENITAL TALIPES EQUINOVARUS CLUB FEET

Between 75 and 80 per cent of all cases of congenital club feet are of the equinovarus type. These are also more difficult to treat than other forms of club feet. The etiology of this condition includes at least a definite neuromuscular imbalance, and in some instances abnormal insertions of the muscles of the feet produce talipes varus and equinus.

Treatment of this type of club foot must include much more than merely an initial correction of the deformity. Treatment should be started by the end of the third or fourth week after birth. Correction of the deformity can be obtained by gentle manipulation and application of a series of plaster casts. The cast should be changed each week until a position of overcorrection is obtained. In some instances the cast may be cut part way around and wedged, leaving a lateral bridge of plaster to serve as a hinge. Care must be exercised to avoid pinching the skin as the opening in the cast is filled in.

In most instances the initial correction or overcorrection of the congenital deformity is obtained without much difficulty. Failures in the treatment of congenital club feet have resulted from failure of the attending physician to inspect the feet at frequent intervals or failure to continue convalescent splinting for a prolonged period of time after the deformity has been fully corrected.

When a satisfactory position of overcorrection has been maintained this final plaster cast should be continued for a period of six weeks. Before removing this cast a Denis-Browne splint which consists of a spreader bar 8 to 10 inches in length, attached to a pair of tarso-supinator shoes, should be obtained. The shoes themselves help to maintain the correction of the varus of the foot and these are attached to the short spreader bar by metal plates and butterfly nuts which make it possible to change the position of external or internal rotation of the foot through adjustments of the shoe on the splint. This shoe should be large enough to provide ample room for the toes. As the foot grows and the shoe is found to fit more snugly, the toe of the shoe should be completely cut out so that the toes will not at any time be constricted.

In the beginning this Denis-Browne convalescent splint should be worn for 22 hours out of each day. It is removed at the time of bathing the infant and left off for an hour. It may again be removed for an hour late in the afternoon. If after six additional weeks there is no recurrence of the initial deformity the splint may be left off for longer intervals each day until it is worn only at night. Night splinting for 12 hours is advisable in most cases for a period of 12 months. This prolonged positional splinting permits some movement of all muscles of the foot, and if the splint is adequate to prevent any recurrence of the deformity the various muscles of the foot will have developed sufficiently to restore balance between the muscles which evert and those which invert.

CONGENITAL SUBLUXATION OF THE HIP

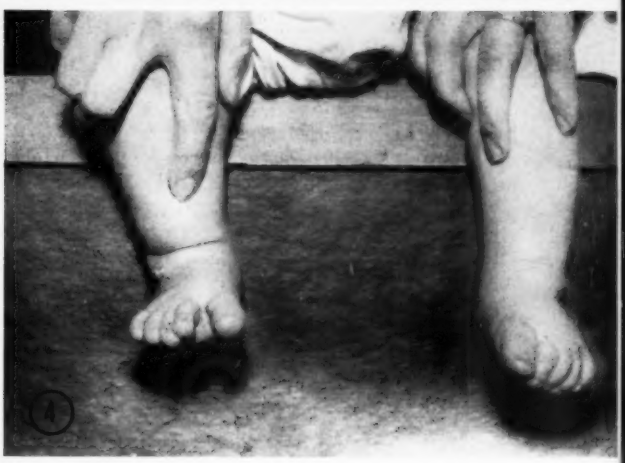
When subluxation is recognized before the age of six months, the condition can be corrected, with subsequent normal development of the acetabulum, femoral head, and the pelvic bones, by the simple process of daily use of the Frejka pillow splint.

Most cases of congenital dislocation of the hip are the result of a primary germ cell defect. Failure of the acetabulum and of the head of the femur to develop normally as the fetus matures and later as the child grows is because of the fact that the two are not in normal relationship to each other. The acetabulum fails to deepen or become rounded or smooth unless the head of the femur is in direct contact with it, and unless motion as well as pressure accompany this union. Similarly, the head of the femur does not become the smoothly rounded structure which we know to be its normal anatomic shape unless it is in contact with and functioning within an acetabulum.

No single consideration in the plan of treatment is more important than that of *atraumatic reduction*. For some cases a preliminary period of traction is needed. Manipulations for reduction should be carried out with gentleness. When the first attempt was not successful, I have waited while the adductor muscles were stretched and softened and then repeated the procedure with care to avoid injury of either soft tissues or the cartilage of the femoral head. General anesthesia has been necessary for the initial reduction in patients more than one year of age. Even when the dislocation was unilateral I have found it advisable to immobilize both legs.

The plan of care for congenital dislocation of the hip is outlined as follows:

1. Early and atraumatic reduction.
2. The so-called "frog leg" cast with 90° abduction and external rotation for three months.



FIGURES 1 and 2. Congenital talipes equinovarus club feet. Correction by gentle manipulation and casts which are wedged or changed at weekly intervals until the deformities are overcorrected.

FIGURE 3. Denis-Browne splints which are worn only *after* complete correction has been obtained. These splints are continued until there is no evidence of recurrence of the deformity.

FIGURE 4. Complete correction of the club feet deformities.

FIGURE 5. Positive Trendelenburg sign which is evidence of a congenital dislocation of the hip.

FIGURE 6. Modified Denis-Browne splint used to maintain reduction of a congenital dislocation of the hip. It may be necessary to use this as a night splint for several years in order to obtain an articulation which is normal in depth, contour and function.

3. A spica cast, with the leg on the side of the dislocation abducted and internally rotated, for a period of two months.

4. A position of wide abduction maintained by bilateral long leg casts, held spread apart by a plaster strut for a period of two months. The child is permitted to sit up and move about as freely as this spreader cast will permit.

5. A modified Denis-Browne splint with a wide bar which holds the legs in as much abduction as can be comfortably maintained. During the first few weeks after application of this splint it is removed for an hour or two each day during and following the bath. If the hip is found to be stable during these periods without the splint, it is gradually left off until after two months it is no longer worn during the day. It should be worn as a night splint for 12 out of each 24 hours until roentgenograms show normal depth of the acetabulum and a well formed and well rounded head of the femur. During this period of night splinting, which may be continued for one to five years, the shoe position on the splint is gradually changed from one of internal rotation to that of slight external rotation. As a result of this positioning of the shoe and hence control of rotation of the legs, the anteversion of the femoral neck has been observed to diminish as further growth occurred.

Patience and perseverance will be rewarded by the development of a hip joint which is anatomically and functionally normal.

ACUTE HEMATOGENOUS OSTEOMYELITIS

Few diseases produced more morbidity or deformity and disability than acute osteomyelitis in the years before the development of drugs or antibiotics such as the sulfonamides, penicillin, and streptomycin. Death from acute hematogenous osteomyelitis in some series showed an incidence as high as 40 per cent of patients hospitalized. Of those patients who survived, a considerable number suffered from multiple bone abscesses, draining sinuses, and eventually succumbed as a result of renal nephrosis or intercurrent infections. The sulfonamides proved to be effective in the treatment of most cases of acute osteomyelitis which was hematogenous in origin. In some instances, however, the organisms were resistant and while the incidence of multiple foci greatly decreased after the advent and use of the sulfonamide drugs, surgery was still necessary for the cure of those patients who developed massive sequestra or abscess formation.

In 1945, together with Schnute and Cattell, I reported the use of penicillin in the treatment of 12 cases of acute hematogenous osteomyelitis in children aged 3 to 12 years, with complete recovery in each of the 12 cases. This study was significant because the organism in 10 of these patients had proved to be resistant to the sulfonamides. With these two drugs we have therapeutic aids which will cure most patients with bacteremia or septicemia before the bones are damaged sufficiently to produce severe local symptoms or roentgenologic changes.

Indeed, it is my opinion that with the continued excellence of general medicine and pediatric care of patients who become ill and febrile, hematogenous osteomyelitis will become increasingly rare. Today most of these patients are cured by the institution of therapy with one or both of these agents or with streptomycin so early after the onset of infection that there are rarely sufficient localizing symptoms for diagnosis of osteomyelitis to be made. And these patients recover without any of the sequelae which were so common before the advent of these miraculous therapeutic agents. While streptomycin in various forms, or other "mycins" supplemented by promizole, is definitely effective against most strains of tuberculosis, the response is not so spectacular in the treatment of bone and joint tuberculosis as the above described therapy of osteomyelitis. These antibiotics, however, are very valuable in helping to localize the tuberculosis and in making the recovery following surgery more rapid and more certain of a satisfactory outcome.

EOSINOPHILIC GRANULOMA

Eosinophilic granuloma is roentgenologically and pathologically similar to the lesions of the bones that are found in Hand-Schüller-Christian disease or Letterer-Siwe disease, both of which are characterized by hyperplastic reaction of the reticuloendothelial system. Some pathologists prefer to call these conditions "reticulo-endotheliosis."

The roentgenographic appearance of the lesion during the acute stage reveals bone destruction with minimal evidence of bone repair and may include stripping of the periosteum through increase in size of the lesion. If the lesion has persisted for several months and has become chronic, a roentgenogram may show more evidence of reactive bone repair. A febrile temperature is not uncommon during the acute phase. Of 53 patients studied by Dundon, Williams, and Laipply, 34 were under 20 years of age, the youngest being six months old. Thirty-six of the 53 had single lesions, 10 had multiple lesions, and in 7 the number of bone lesions was not given.

Solitary lesions of eosinophilic granuloma usually heal following curettage and they have been treated successfully without operation by x-ray therapy. Some of them have healed without any treatment.

Other intramedullary lesions which clinically and roentgenologically may be mistaken for eosinophilic granuloma are fibrosarcoma, myeloma, tuberculosis, syphilis, and leukemia. An error in diagnosis may result in the death of the patient.

Management of the Asthmatic Attack in Childhood

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Because of the anxiety and fear engendered in the child and his parents by an attack of asthma, this syndrome appears in the forefront of emergency practice. The symptomatic therapy of the asthmatic attack is therefore of great interest to the physician.

The most serious errors in its management generally are overmedication and a bad choice of drugs. A child may die in an asthmatic attack and such a death may usually be attributed to faulty treatment.

The first essential is for the physician to determine that he is dealing with a true attack of asthma, and not with a condition due to causes other than allergy, such as a foreign body, tuberculous glands, tracheobronchitis, Löffler's syndrome, tumor pressure on the bronchi, and so on. Once the diagnosis is established, he may proceed with therapy and the following are suggestions which may be found helpful.

DRUG AND GENERAL THERAPY

1. A small dose of epinephrine, 2 to 3 minims of a 1:1000 dilution, may be given subcutaneously. It may be repeated intracutaneously, if necessary, two or three times, at intervals of 20 to 30 minutes.

2. If epinephrine is not effective, give syrup of ipecac by mouth, one or two teaspoonfuls, depending on the age of the patient and his response. Follow the ipecac promptly with a glass of lukewarm water to produce emesis.

3. Adjuvants:

a. Give the patient an enema.

b. Remove him from the bedroom into another room and prop him up in a chair.

c. Open the windows and if not enough air is circulating in the room turn on an electric fan, directing the current of air toward the child. He must be protected from chilling, obviously.

d. Asthma powders may be burned.

e. Unmedicated steam inhalation is important.

f. A cheerful attitude must be maintained by all who attend the patient, and every effort must be made to divert him.

4. If the attack is severe and prolonged, the ipecac emesis may be followed by:

a. Ten per cent intravenous glucose by slow drip infusion (300 cc. for younger children and 500 to 1,000 cc. for older ones). This is an important procedure because it allays dehydration which is usually present, and also reduces edema.

b. A rectal retention dose of a lower motor neuron sedative, such as bromides, 10 to 15 gr.; phenobarbital, ½ to 1 gr.; chloral hydrate, 5 to 7 gr.; ether in oil, 1 to 2 teaspoonfuls in 1 to 2 ounces of olive or other salad oil.

c. Sedatives by mouth may be given in the form of triple bromides, 5 to 15 gr.; phenobarbital, amytal, seconal, or nembutal, ½ gr.; and/or acetylsalicylic acid, 5 to 10 gr. This sedation may be repeated in two or more hours if needed.

d. Oxygen therapy is soothing and reassuring, but the patient should not be placed in an oxygen tent, for claustrophobia is very pronounced during severe asthma. It is for this reason that a gentle breeze from a fan is also reassuring.

5. The patient in status asthmaticus, having relieved himself of the obstructive bronchial plugging, the dehydration relieved by the intravenous infusion of glucose, and quieted by the sedation, usually falls into a tranquil sleep. However, the emetic dose of ipecac may be repeated and additional sedation given if the desired result is not achieved immediately.

6. Someone must remain with the patient continuously. He must definitely not be left unattended at any time during a severe attack.

7. When the patient recovers from the acute phase of the attack, he should be put on a salt-free diet, high in carbohydrates Plenty of liquids, particularly the cola drinks and other sweet beverages—if he is old enough to have them—should be given. These measures, i.e., the salt-free, high carbohydrate diet with sufficient liquids, are supportive, increasing diuresis and tending to rid the

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body of the offending allergens that are present.

All the procedures outlined can readily be carried out in the home. If, however, the physician prefers to hospitalize the patient, there is no danger in moving him. At times when children are moved to another room or are being transported to the hospital, the attack may clear up. The inference from this would be that psychogenic or environmental factors are involved, rather than food sensitivities.

PREVENTIVE MEASURES

Wherever possible an effort should be made to determine, through allergic skin tests, what offending substances cause the asthmatic attacks. Therapeutic procedure depends on one's findings.

It is not within the scope of this paper, however, to go into a lengthy discussion of such procedure, but rather to suggest what course may be pursued in those instances in which the physician cannot resort to skin testing.

Environment—In cases in which environmental sensitivities are suspected because of the history, all sources of dust should be eliminated to as great a degree as possible. Dust-producing articles of clothing, bedding, and furnishings should be investigated, not only in the patient's own room but throughout the home. Whenever possible, feather and cotton-filled pillows should be replaced with latex pillows. Foam rubber or horse hair mattresses are preferable to those filled with cotton, kapok, or other types of stuffings. If these substitutions are not feasible, all pillows should be covered with a tightly woven textile made of long-fibred cotton, such as Pima. The seams should be doubled to prevent dust seepage. Mattresses can be covered first with plastic and then with a second cover of cotton for comfort and to prevent perspiration that the rubber and plastic materials induce.

Wood and metal chairs are preferable to the overstuffed variety. Floor coverings and hangings, if necessary, should be washable.

Animal pets and stuffed toys are best removed.

Immunization against the dust inhalants and pollens should be instituted.

Environmental control should be permanent.

Food—A careful history may help to relate the onset of symptoms to the ingestion of a new food. If the food is one which the mother ate in excess during the latter months of pregnancy, the infant may have been sensitized in utero. Particular questioning should be directed to excessive indulgence in eggs, milk, egg and milk-containing foods, wheat, fish, nuts, candies, fruits, and vegetables.

Occasional feedings of raw milk during the neonatal period, when a child is breast fed, raw foods taken during convalescence from disease, overfeeding and too early introduction of solid foods in infancy, may all help to explain sensitization. Questioning along these lines may point to the incriminating food.

For the alleviation of symptoms suspected to be attributable to food sensitivities, much can be accomplished by the employment of a heat-denatured diet which is composed of:

1. Evaporated milk or boiled milk
2. Boiled meats of all varieties
3. Broths and soups of all varieties
4. Hard boiled eggs
5. Cooked cereals and precooked cereals
6. Spaghetti and macaroni
7. Dextri-maltose, corn or cane sugar
8. Melba toast, Rye-krisp and Triscuits
9. Cooked vegetables
10. Stewed fruits, jams and jellies, hard candies

Since this diet is devoid of any fresh fruits or vegetables, vitamin C must be provided by adding 50 to 100 mg. of ascorbic acid per day.

After all symptoms have disappeared and the child has been free of attacks for a prolonged period, one fresh or lightly cooked food at a time may be substituted in the denatured diet. In this manner one can determine empirically which food is at fault. If the newly introduced food is well tolerated, it may be continued. Those foods which cause difficulty of any kind must be continued in denatured form when the patient returns to an otherwise normal diet.

PALLIATIVE AND PREVENTIVE DRUG THERAPY

The antihistaminic drugs are manufactured by many pharmaceutical firms under various names. In my experience they are contraindicated in asthma. Some have found them of value for the alleviation of nasal symptoms—so-called colds—and the early symptoms of asthma, before the patient becomes dyspneic. They can be given in 50 mg. doses every four hours. If untoward side reactions occur they should be discontinued.

An effective preventive remedy, if used in the early stage of onset of symptoms, is a combination of drugs well tried in allergy. These combined drugs act synergistically. Since they are effective in small doses, I have found them of value in children. They should be kept on hand so that they may be given at the earliest appearance of symptoms. If the child seems to be developing a cold, the tablets should be given every three or four hours. In this way symptoms may be allayed and an attack aborted. If this therapy has been started too late, and a full-blown attack develops, the tablets are of no avail and should be discon-

tinued. However, when the severe symptoms subside, they often help in the final stages of the attack.

THERAPEUTIC DON'TS

1. Large doses of epinephrine should never be used. If small, repeated doses are ineffective, giving ½ to 1 cc. will not be more effective. Actually the larger dose does not relieve the asthma but causes an even greater spasm of the bronchioles, thus aggravating the asthma. It also causes pallor, apprehension, cardiac syncope, vascular congestion, increased pulse rate, and heightened blood pressure.

2. Do not use morphine or its derivatives because these drugs have been known to cause death in an asthmatic attack. Demerol is also contraindicated.

3. Some antihistaminic drugs are contraindicated during the height of an asthmatic attack.

4. Do not permit the patient to be apprehensive about his condition:

a. Employ adjuvant therapeutic measures.

b. Administer some form of mild sedation.

c. Do not permit the patient to be left alone.

Finally let me state that I believe that asthma is not a disease that should be treated solely from a symptomatic standpoint. Every effort should be made to ferret out the causative factors, whether they pertain to the diet, environment, psychosomatic or constitutional phases of the individual. With an understanding of all of the factors involved, a good prognosis can be made.

Treatment of Scarlet Fever

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SCARLET fever is one of a number of hemolytic streptococcal infections of man and is characterized by a sudden onset with prodromal symptoms of sore throat, vomiting, fever and headache, succeeded by an erythematous punctate rash which generally ends in desquamation. Readily discernible clinical types are the following: moderate, moderately severe, septic, toxic, surgical and convalescent. Treatment of the disease may be divided into the following categories: general therapy, treatment of clinical types, treatment of carriers, and treatment of complications.

GENERAL TREATMENT

Scarlet fever patients should be at rest in bed and isolated from individuals for their own protection, as well as that of others. The minimum period of bed rest for infants and children is two weeks and that for adults one week barring complications in which instance the period is extended. Early resumption of activity is satisfactory for mild infections but severe attacks or complications warrant caution. The sickroom should be well lighted, easily aired and adjacent to a bathroom.

Fluid balance is an important item in all fevers and scarlet fever is no exception. The daily intake of fluids should vary between 1,500 and 3,000 cc. depending upon age and degree of dehydration. For critically ill patients a 24-hour record of intake and output should be kept and definite orders should be written daily with respect to the amount of oral or parenteral fluids necessary. During the acute phase, the diet should be fluid but when the temperature has dropped to near normal, a semisolid or full diet may be offered. In general, the diet may be generous with few restrictions except when nephritis occurs. Regular elimination is desirable and 24 hours should not pass without a bowel movement; one of the milder cathartics should be used and failure at 48 hours demands an enema.

SYMPTOMATIC TREATMENT

The alleviation of acute manifestations of scarlet fever is a minor problem because the disease is presently so mild. Adequate hydration often serves to lower high temperatures and tepid sponging should be resorted to only when fever is 105° F. or above. A proper fluid balance also modifies the headache and sore throat which are usually present. Severe headache responds to the use of a coal tar

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derivative. Headache due to clogged paranasal sinus openings is alleviated by use of ephedrine nose drops or similar medications designed to shrink mucous membranes. For older patients an inhaler incorporating ephedrine or benzedrine is of value when properly used.

Severe sore throat responds to frequent gargles of 10 gr. of acetylsalicylic acid suspended in half a tumbler full of water. Hot water douches are soothing but both gargles and douches are contraindicated in children because of unfamiliarity and the danger of forcing infectious material from the throat up the eustachian canals into the middle ear; in addition, infectious material may enter the paranasal sinuses and cause infection there. An ice collar placed tightly about the neck gives relief in sore throat.

Moderate cervical lymphadenopathy responds to the use of a tight ice collar but when severe or refractory, or when the neck swelling is marked, hot moist compresses are soothing when frequently renewed. If pruritus occurs, harsh soaps should be eliminated; milder soaps should be used sparingly or not at all and the skin should be anointed twice daily with a baby bath oil or with an olive oil and glycerin mixture (one part of glycerin to four parts of olive oil).

TREATMENT OF CLINICAL TYPES

Moderate scarlet fever responds favorably to symptomatic treatment. An extended experience has determined that sulfonamide or antibiotic therapy should be withheld until a complication occurs. Prophylactic treatment to forestall the negligible chance of a complication in this type and entailing two weeks of therapy seems unwarranted when a brisk attack on the complication when it occurs has been found to be eminently satisfactory. However, drug therapy is indicated when weaklings contract moderate scarlet fever.

Moderately severe scarlet fever may be treated with sulfonamides, antibiotics or serum. Either sulfadiazine or sulfamerazine is suitable, given in an initial dose of 3 gm. and a maintenance dose of 0.5 gm. every four hours until clinical improvement has occurred or for not less than five days, following which 0.25 gm. is given at the same interval for an additional three to five days. Sodium bicarbonate need not be given at adjusted dosage levels for children unless there is kidney disease, but adults must be carefully watched for decreased kidney elimination or the presence of red cells in the urine. Should any other complication develop, therapy should be resumed at a slightly higher level and continued until the condition has improved.

Penicillin appears to have no therapeutic advantage over the sulfonamides but is preferred because side reactions occur less frequently. An initial dose of 100,000 units of soluble penicillin G should be given intramuscularly followed by a 12-hour dose of 100,000 units for a period of five days, tapering off during the following three days if indicated. The drug may be given orally, if tolerated, in a dose of 100,000 units given at four-hour intervals for a period of five days dropping to half dosage for an additional week when indicated. It is unnecessary to use both a sulfonamide and penicillin simultaneously for scarlet fever of this severity.

Aureomycin and terramycin have been used too infrequently in scarlet fever to warrant an opinion of their efficacy; it has been suggested that they may be of value.

Scarlet fever convalescent serum or scarlet fever antitoxin is satisfactory in the treatment of the moderately severe case, but the former is not readily available everywhere and use of the latter may produce serum sensitivity. In addition, toxemia in moderately severe scarlet fever is minimal and use of antitoxin is unnecessary. One vial of convalescent serum (30 cc.) or one therapeutic dose of antitoxin (6,000 units) usually suffices.

In *septic scarlet fever* the organism and not its toxin is responsible for the disease state and antitoxin is of little value. Sulfadiazine or its sulfonamide equivalent and penicillin, when given in adequate dosage alone or in combination for cases responding poorly to one or the other medication, are very satisfactory therapeutic agents. The initial dose of sulfadiazine is 6 gm. for a 150-pound adult and the maintenance dose 1 gm. every four hours until marked improvement has occurred, reducing the dose to one half and later to one quarter until a week of normal temperature has been recorded. It is advisable to have a minimal sulfadiazine blood level of 15 mg. per cent.

Penicillin should be given in doses of 100,000 units of soluble penicillin G and 300,000 units of crystalline procaine penicillin G, both contained in 1 ml. administered intramuscularly at 12-hour intervals for five days or longer; on marked improvement, the same amount of penicillin may be given once daily until the temperature has been normal for one week. The dosage schedule prescribed should assure a blood penicillin concentration of 0.25 unit per milliliter at the end of one hour and a level of 0.05 to 0.1 unit per milliliter throughout the first five days of treatment. The combined use of a sulfonamide and penicillin is not advocated except in severe cases which do not respond to adequate use of a single agent. Whole blood should be given during convalescence if the degree of secondary anemia warrants it.

Toxic scarlet fever responds very well to the use of scarlet fever antitoxin but unassociated with a septic tendency does not respond well to sulfonam-

ides, penicillin or whole blood alone or in combination. Antitoxin should be used intravenously after a careful check has been made for serum sensitivity. If both history for allergy and a skin test for serum are negative, 1 ml. of antitoxin diluted 1:10 in normal saline may be introduced slowly by vein. If no reaction occurs after 20 minutes, one therapeutic dose of scarlet fever antitoxin (6,000 units) is given intravenously diluted 1:10 in distilled water or normal saline and repeated in 12 hours if there is slight or no improvement. To obviate serum reactions, 5 to 8 minims of adrenalin may be added to the intravenous mixture. Additional doses of antitoxin are not often necessary.

Occasionally, scarlet fever is of a mixed septic and toxic type and both penicillin and antitoxin should be given in the amounts already suggested. Penicillin may be decreased in dosage by age but antitoxin is given in the same amount at any age.

Surgical scarlet fever is so designated because it follows an operation about the face or neck, a wound or a burn and the treatment regimen depends upon its clinical type. Thus, a patient may have surgical scarlet fever of a moderate, moderately severe, septic or toxic type. In addition, surgical attention should be given, if indicated.

Convalescent scarlet fever poses a therapeutic problem only if one or more complications exist and treatment of complications is briefly described below.

TREATMENT OF SCARLET FEVER COMPLICATIONS

Scarlet fever of the septic and toxic types is now infrequently encountered and the proportion of moderately severe cases has decreased. As a result, complications are far less common and severe than noted a decade ago. The commonest complications continue to be rhinitis, otitis media and cervical lymphadenitis and all, being septic in origin, respond well to sulfadiazine or penicillin therapy. Treatment described under moderately severe scarlet fever assures satisfactory results.

If suppurative otitis media is suspected slightly augmented dosage may defer or negate the need for incision of the eardrum but persistence of high fever in the face of adequate therapy demands incision and drainage. The pain and discomfort incident to cervical lymphadenitis can be relieved early by a tight-fitting ice collar and later by frequently renewed hot moist compresses.

Mastoiditis demands more vigorous treatment (a blood level of 15 to 20 mg. per cent of sulfadiazine or 0.1 unit per milliliter of penicillin) with alertness to the need for surgical intervention in the relatively few instances in which therapy fails. Suppurative lymphadenitis and peritonsillar or retropharyngeal abscess may necessitate surgical treatment along with drug therapy. The uncommon nephritic and cardiac complications are managed as like manifestations unassociated with scarlet fever.

TREATMENT OF CARRIERS

Hemolytic streptococcal carriers in home, hospital, boarding school or orphanage often pose a knotty problem. Tonsillectomy and adenoidectomy result in clearing a majority. The sulfonamides have been disappointing although 1 gm. twice daily for three days will prevent the overt disease for a period of two weeks and repetition of the course may be necessary or desirable. Penicillin in large doses appears to be more effective. Streptococci are practically eliminated by the injection of soluble aqueous penicillin G, 100,000 units and crystalline procaine penicillin G, 300,000 units combined in 1 ml. twice daily for seven days. Daily nose and throat cultures become negative after a course of treatment but in some instances the organisms reappear two weeks to a month later. It is advisable to repeat the course when this happens.

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GENERAL PRACTICE *Review*

To provide the general practitioner, as well as the specialist with concise, readily available information on the latest, proved methods of treatment of conditions commonly encountered in an average practice, POSTGRADUATE MEDICINE *offers this department to its readers. It is not, of course, intended to present these discussions as the only acceptable therapeutic procedures to be used, but rather to offer simple regimens and recommendations based on the extensive experience of the physicians who prepared these summaries.*

Treatment of Leukemia

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In the treatment of the leukemias, as in all other diseases, a correct diagnosis as to type is of great importance in determining the method of therapy to be used and is of prognostic value as to the response to be expected. In the acute leukemias of childhood, however, it is often impossible to determine to which series the leukemic cells belong. Examination of the sternal marrow is of great importance and should be done on all patients. Therapeutic measures will be discussed below according to the type of leukemia. Since this discussion is of necessity limited, references to more complete treatments of each subject are available.*

CHRONIC LYMPHOCYTIC LEUKEMIA

Indications for therapy—Symptoms of weakness, anemia, enlarged or disabling nodes or organs.

Supportive measures—Blood transfusions, antibiotics for infection.

Specific therapy—Irradiation, radioactive phosphorus, urethane, or nitrogen mustard may be used. These agents should be given cautiously and conservatively. Abnormal lymphoid tissue may sometimes be more resistant to treatment than the normal cells in the bone marrow, and the reduction of the white cell count to normal may be accompanied by severe toxic manifestations. By judicious use of any of these agents, however, considerable symptomatic improvement may be produced frequently in patients whose general condition is only moderately impaired by the disease.

X-ray therapy is generally preferable in treating enlarged nodes and other organs. Radioactive phosphorus has induced satisfactory remissions and may give less nausea and vomiting. Urethane and nitrogen mustards have not been generally as useful, although in occasional patients very satisfactory results have been obtained.

Hazards of therapy—Excessive dosage may produce thrombocytopenia, bleeding, and anemia, apparently due to the depression of the bone marrow.

CHRONIC MYELOCYTIC LEUKEMIA

Indications for therapy—Weakness, anemia, and enlarged liver and spleen.

Supportive measures—Blood transfusions, antibiotics.

Specific therapy—The clinician's choice of agents in the treatment of chronic myelocytic leukemia is varied; x-rays, radioactive phosphorus, arsenic, benzol, urethane, and nitrogen mustards are all effective in the early stages of the disease and will produce clinical and hematologic remissions.

Irradiation of the spleen is probably the best and

*Bibliography furnished on request to Postgraduate Medicine.

simplest method of treating the early disease. Radioactive phosphorus may give equally good remissions. Urethane is a convenient drug to use since patients may take it by mouth on an outpatient basis. On therapeutic doses of 3 to 6 gm. a day, remissions are usually produced in three or four weeks and maintenance therapy at a lower dose level may then be continued indefinitely. Since the treatment is continuous, the nausea and vomiting which often accompany its use may contraindicate further treatment. This same objection may also apply to the use of arsenic in the form of Fowler's solution.

The nitrogen mustards also frequently produce nausea and vomiting, but since a single course of treatment with methyl bis (beta-chloroethyl) amine, 0.1 mg. per kilogram of body weight daily for four days, produces a remission which usually lasts from one to three months, these toxic effects are of such short duration as to be no contraindication to therapy.

In the early stages of the disease, remissions can occasionally be produced by the antagonists of folic acid, but these are of extremely short duration and are usually accompanied by toxic manifestations. This is, therefore, not a practical method of therapy.

As the disease approaches the terminal stage with marked splenomegaly, lymphadenopathy, occasional bleeding, severe anemia, and an increased number of immature cells in the blood and marrow, all therapeutic agents become progressively less effective, and, although trial of several methods may be made, in our experience it is rare to have one succeed where others have failed. It was hoped that in this stage of the disease where the more conventional methods fail, beneficial effects might be obtained with the folic acid antagonists aminopterin (4-amino-pteroylglutamic acid) or A-methopterin (4-amino-N^{10}-methyl-PGA). In the patients we have studied, however, such has not been true.

Hazards of therapy—Excessive treatment will produce depression of the bone marrow.

In the treatment of both chronic forms of the disease, the newer chemotherapeutic agents have little advantage over adequate x-ray therapy.

ACUTE LEUKEMIA

Indications for therapy—Diagnosis of acute leukemia.

Supportive measures—Antibiotics and blood transfusions.

Specific therapy—The conventional agents such as radiation, arsenic, benzol, urethane, and the nitrogen mustards which have definite palliative effect on the chronic forms of the disease are without beneficial effect on acute leukemia.

The introduction of the antagonists of folic acid (aminopterin, A-methopterin, etc.) by Farber and others has provided agents which produce relatively complete hematologic and clinical remissions in 20 per cent to 25 per cent of the patients. These remissions, in our experience, have been observed chiefly in children and young adults. Most of the leukemias which respond could be classified only as stem cell in type, but some cases of the acute lymphoblastic and myeloblastic varieties have also responded. None of the acute monocytic leukemias in our series were benefited.

The amounts of aminopterin or A-methopterin that patients need to produce remissions or can tolerate before developing symptoms of toxicity (stomatitis, diarrhea, gastrointestinal bleeding) vary tremendously and it is to be emphasized that dosage must be suited to the individual patient. Particular care must be exercised in the administration of these drugs to severely debilitated patients, or to those with impaired renal or hepatic function.

Leukemics with initial high peripheral leukocyte counts may also be extremely sensitive to antagonist therapy. The usual daily dosage of these drugs in a 5-year-old child would be 1 mg. of aminopterin or 5 mg. of A-methopterin given intramuscularly in saline or by mouth dissolved in water or orange juice. The average dosage for adults may be increased up to 2 to 3 mg. daily of aminopterin or 10 to 15 mg. daily of A-methopterin. During therapy, daily determinations of hemoglobin, white blood count, and differential counts should be done.

The plan of therapy used here in the treatment of some 80 patients with acute leukemia calls for administration of the drug until either a complete remission occurs as evidenced by clinical signs and by the blood and marrow differentials, or until toxic manifestations of stomatitis, diarrhea, or gastrointestinal bleeding appear. In the patients showing signs of toxicity, if a complete remission does not occur, therapy is resumed at a slightly lower dose in one to two weeks when the symptoms have subsided, and is continued until the signs of either remission or of further toxicity appear. Signs of remission are usually seen within from fourteen to thirty-five days after the start of therapy, but wide variation in the time of response may occur.

Once a complete remission has been produced, maintenance therapy may be given or treatment may be temporarily stopped. We prefer the latter course. The patient is followed by means of clinic visits every two weeks at which time a short interval history, a careful physical examination, and determinations of hemoglobin, white blood count, peripheral blood, and marrow differentials are done. Particular emphasis is laid on the sternal aspiration in the intermittent type of therapy as it is usually by this technic that the first evidence of relapse can be detected. Thus the treatment can be resumed and the relapse aborted, often without clinical evidence of a relapse ever appearing.

In those patients who have responded once, repeated remissions can be expected. Eventually, however, these responses become less and less satisfactory and finally the patient may become resistant to all therapy. Three other antagonists of folic acid, 4-amino-9-methyl-PGA, 4-amino-9,10-dimethyl-PGA and 4-amino-pteroylaspartic acid have also been used. While remissions have been produced by all these derivatives, there is no evidence that they possess any definite advantage over aminopterin or A-methopterin. Although they are in no way a cure for the disease, the antagonists of folic acid have a real place in the palliative therapy of acute leukemia.

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Treatment of Fingertip Amputation

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Traumatic amputation of the fingertips is one of the most common injuries seen in emergency practice whether caused by industrial or home accidents. The repair of such injuries usually involves considerable thought as to what will give the best functional and economic results for the patient. The cosmetic result is of minor importance but even this must be borne in mind in persons whose hands are continually exposed to view, such as actors, doctors, dentists, etc.

There are essentially six things which can be done when the patient with a traumatic amputation of the fingertip presents himself:

1. **The amputated finger-stump can be left alone** and allowed to heal spontaneously. In minor amputations of soft tissue only, in which the bone is not exposed and where oblique lacerations are present, the wound can often be dressed with nonadherent, fine-mesh gauze and allowed to epithelialize. This epithelium covers a soft pad of subcutaneous tissue and provides a very satisfactory fingertip. Such lacerations are frequently seen in butchers and others where a meat slicer has taken off a small portion of the tip. Quite a sizeable "slice" can be removed and still heal, giving an excellent result. This rule for leaving the fingertip alone applies only to small losses, however, in which there is still good subcutaneous tissue.

For economic reasons or other reasons which prevent more elaborate treatment of the amputated finger-stump, it may be necessary occasionally to leave untreated a severe amputation of the fingertip which should be treated by more elaborate means. Such an instance might occur in a person who had sustained severe and shocking general injuries and in whom the fingertip injury is of relatively minor importance. If at all possible, however, the wound should be covered with a thick-split skin-graft even as a temporary covering. This is preferable to allowing the open, draining, suppurating, painful condition which results when a fingertip amputation is left untreated.

2. **A second technic of treatment** is to recover the lost tip and replace it. This procedure is sometimes successful, particularly when the cut has been clean and relatively atraumatic, such as by sharp knives or meat-slicing machines. In such cases, where the amputated portion is sufficiently thin to survive, it can be washed in normal saline and after light debridement of the wound, it is sutured in place.

Where skin alone or skin and a small amount of fat are present in the amputated tip, one has the best chances of success. Thicker pieces will usually die and delay wound healing by several weeks.

It is preferable in such instances to use cool normal saline solution and make a continuous wet compress over the amputated tissue. The purpose of this cooling is to decrease the metabolic needs of the graft and it is possible to save a number of tips which would otherwise fail to survive. The partial refrigeration of the tissue seems definitely to aid its reestablishment of blood supply and subsequent recovery.

3. **The finger may be amputated at a more proximal level.** This is the treatment most commonly used by doctors who are faced with a large

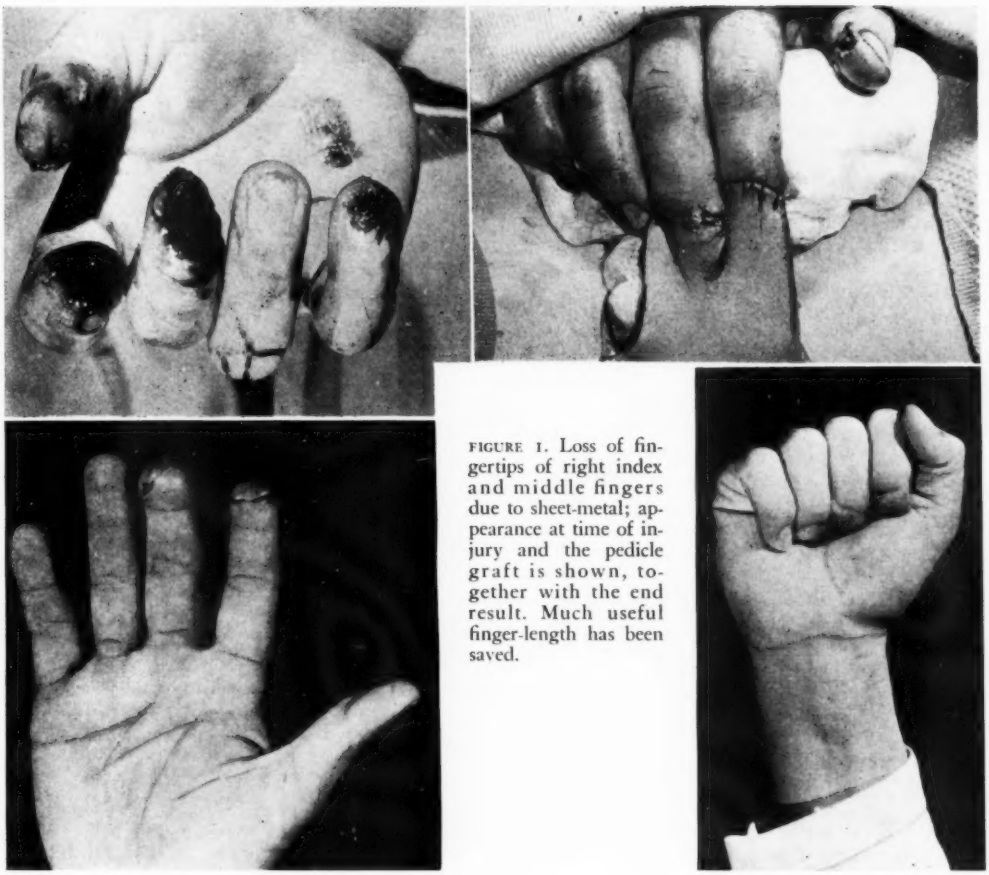

FIGURE 1. Loss of fingertips of right index and middle fingers due to sheet-metal; appearance at time of injury and the pedicle graft is shown, together with the end result. Much useful finger-length has been saved.

number of traumatic cases and wish to have the wound healed and the patient back to work in the fastest possible time. While the above result is obtained in a certain number of cases, the loss of function of the fingertip is no small matter in many highly specialized or skilled professions and trades. It usually results in some weakness of the grip and in an alteration of the patient's facility in using his hand. In young persons especially, one should try to avoid more proximal amputation if at all possible, because one never knows what trade or profession they may seek out later in life in which the missing member may be of vital importance.

In the case of a man in the lowest economic group who is doing manual labor it may, however, be advisable to do an amputation rather than to apply a pedicle-graft as would be done for essentially the same injury in a person in another economic group. In addition, in very old persons, the immobilization incident to the application of a pedicle-graft would also indicate amputation rather than use of the pedicle because of stiffening of the shoulder and elbow joints incident to fixation.

4. A fourth method of treatment is **the use of a thick-split skin-graft.** The amount of skin necessary to cover a fingertip is so slight that even a relatively unskilled surgeon should be able to cut a thick-split skin-graft to be applied to the raw defect. When a thick-split graft is applied to a raw surface, the wound is healed in a few days. If there is a good pad of subcutaneous tissue, this may give a very satisfactory result by itself. If the bone is exposed, the graft may become adherent to the bone and a painful fingertip will result. However, with the wound promptly healed, a pedicle graft can be applied secondarily without any great difficulty. It is often possible for the doctor who sees the patient first to cover the wound with a thick-split skin-graft and later refer him for specialized care to one who does pedicle grafts if the

doctor himself does not care to do this type of surgery.

There are two technical difficulties encountered in applying a thick-split skin-graft to an amputated fingertip. One is fixation and the other is control of bleeding. The control of bleeding is particularly difficult because the blood supply to the fingertip is so rich that it would be necessary to clamp and crush almost the entire bed on which the graft is to be placed if all bleeding were to be controlled. The usual way of obviating this is to use the bloodless field which is obtained by winding the limb bloodless with an Esmarch bandage up to the level of a pneumatic tourniquet which is then inflated above systolic pressure, the debridement is carried out and the tourniquet is then released.

Any large arterial bleeders are clamped and tied. It is often necessary to use a transfixion ligature to secure firm ligature of these vessels. The limb is again wound bloodless with a sterilized Esmarch bandage and the tourniquet re-inflated while the skin-graft is sutured in place. The sutures are left long. A small wad of nonadherent fine-mesh gauze is then applied to the surface and the sutures which have been left several inches long are tied over the top of this bolster. This secures both fixation and hemostasis, with intimate contact between the graft and the raw surface which it is covering. When the tourniquet is released the pressure of the bolster controls the bleeding. To further fix the graft, splints should be applied to the finger, particularly in children, where the splint should project beyond the end of the finger to act as a "bumper."

5. **A full-thickness graft** (Wolfe graft) can be applied to an amputated finger-stump. Where the tissue loss has been confined to the skin and only a moderate amount of subcutaneous tissue, and where there is still sufficient fat covering the bone, the use of a full-thickness graft is sometimes indicated as a permanent repair. A piece of full-thickness skin which is sufficiently large can be obtained by an elliptical excision from the abdomen and the donor site can be closed as a single suture line. The graft is thoroughly cleaned of any attached fat and areolar tissue on its under surface until a firm, resilient, full-thickness skin graft is obtained. This is then sutured in place as previously described for the thick-split skin-grafting making sure that edge to edge approximation is obtained. For small defects this is a very suitable method of treatment.

6. **Pedicle graft.** A pedicle graft of skin and subcutaneous tissue is necessary wherever the loss of tissue is sufficiently deep that skin alone will not suffice to cover it. Since it is rarely possible to obtain such a flap from the local area a flap from a distance must be applied. The most suitable donor site for such a flap is usually the mid-axillary line on the opposite side from the injury.

The injured hand is placed across the chest in a comfortable position and one can then design a small "trap door" type of flap which is made in the shape of a U with the base wider than the tip. This should be designed in such a way that it applies to the defect on the finger without kinking because the amputated fingertip may be at an oblique angle and serious kinking of the pedicle-graft would occur, shutting off its blood supply. Utilizing a small piece of gauze, one can plan the flap which is most suitable and mark a pattern before any actual incision is made. This "trap door" type of flap of the open variety is much preferred to the old method of burying the fingertip beneath the skin of the donor site. It is easy to keep clean and the bed from which the flap is raised is covered with a small thick-split skin-graft so that all areas are closed.

The pedicle-graft operation can be performed under local anesthesia. This is often preferable as in general anesthesia the excitement stage, particularly during the recovery from anesthesia, may put undue tension on the flap whereas the cooperation of the patient is available during the operation when it is performed under local anesthesia. In children, of course, general anesthesia must be employed.

In the use of local anesthesia a warning should be given against injecting novocain into the finger itself. Regional block anesthesia, blocking the median or ulnar nerve at the wrist and the superficial branch of the radial nerve over the radius should be used. Blocking the finger can result in serious complications even including gangrene of the finger. Local infiltration is used to raise the flap and local infiltration can be used to take the thick-split skin-graft which is used to cover the secondary defect beneath the flap.

Fixation is secured with adequate padding, using adhesive over the shoulders and about the arm. Care should be taken in adults to see that the axilla is kept free and that a piece of gauze can be put beneath this and changed frequently. If this is not done, the perspiration and maceration can occasionally result in infection and axillary furuncle formation, which is a serious complication, may compromise the entire result of the pedicle-graft.

The flap is attached to the fingertip for three weeks. At the end of this time, the flap is divided, taking care that an adequate amount of tissue is left attached to the finger and excess fat is removed from the flap so that it can be folded into position. The flap is then trimmed to give the best possible covering to the fingertip. It is occasionally necessary, in covering extensive defects, to leave a "dog-ear" or fold in the flap which projects beyond the future contour of the finger. This is necessary to obtain blood supply and if such excess tissue is

removed it may interfere with circulation. Thus, such a projection should be left to be excised as a minor office procedure at a later date, when healing has taken place.

This last objection to pedicle-grafts on the finger is one which sometimes precludes their use, because it is very often necessary to do a minor secondary revision to obtain satisfactory contour for the finger. Other objections are that sensation is not present in the pedicle-graft for several months following repair. Thus, it is necessary to protect the finger with a glove or other protection for a considerable length of time following injury. In some occupations this constitutes a serious hazard.

One other objection to the pedicle is that it is sometimes so loose and lacking in skeletal support that it slides on the fingertip and gives an insecure grip when picking up objects. For this reason if there is extensive loss of bone, one should reamputate at a more proximal level rather than trying to apply a pedicle graft to lengthen a finger without adequate skeletal support. Experience here is the only criterion on which judgment can be based. Figure 1 shows typical pedicle-graft application and end result.

SUMMARY

Fingertip amputations are common injuries. They can be treated by one of six methods. They can be left alone, the lost tip can be replaced, they can be reamputated at a higher level, a thick-split skin-graft can be applied, a full-thickness skin-graft can be applied, or a pedicle-graft can be used to cover the amputated tip. Indications and technics for the various treatments of fingertip amputation have been outlined.

Treatment of Epilepsy

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The general practitioner who seeks the latest knowledge in the therapy of epilepsy is faced with a stupendous problem. Thus, in the year of 1947, in order to keep abreast of the world literature on epilepsy, he would have to read some 373 articles published in 222 journals. In the following an attempt is made to give a brief outline of the treatment of the "average" epileptic. This average would include between 70 and 90 per cent of the epileptic population. It is this group which the general practitioner can and should treat.

Therapy of epilepsy is classically divided into four headings: (1) prophylactic; (2) general management; (3) social-psychiatric-restorative, and (4) specific. The first three headings can be dispensed of very quickly by indicating that the epileptic represents no unusual problem from a general standpoint and is treated as a "whole" patient. Of course, attempts should always be made to inform the patient, both by word and by selected reading, of the nature of his illness.

PRINCIPLES OF MEDICAL MANAGEMENT

The key in the management of the epileptic is the recognition of the type of seizure from which he is suffering. Classically there are three groups: grand mal, petit mal, and psychomotor (epileptic equivalent, psychomotor equivalent, psychic fugue state, etc.).

The grand mal seizure may be of several varieties including tonic, clonic, tonic-clonic, focal, jacksonian, and atonic.

Petit mal (pykno-epilepsy) is characteristically a short seizure, rarely enduring more than five to thirty seconds, typically associated with a rhythmic 3-per-second blinking of the eyes, usually not associated with falling, and limited almost exclusively to childhood and adolescence. There are two other categories which are usually included under petit mal, namely the myoclonic and akinetic. The myoclonic seizure is a split-second seizure involving one joint or the entire body. The akinetic seizure is typified by a sudden loss of tone and unconsciousness of momentary duration.

The electroencephalograph is of inestimable aid in the differentiation of the more obscure or unusual type of seizure, as well as being an excellent guide in therapy.

The patient should be instructed to keep a record of the number and types of seizures. This is important from the standpoint of evaluating the effect of a particular type or dose of medicine.

It is best to try the effect of one drug at a time in order to determine both its beneficial as well as its side effects.

The drugs which the general practitioner needs in the treatment of the average epileptic are few in number. They would include phenobarbital, dilantin, tridione, and mesantoin. The newer drugs, including phenurone, gemonal, paradione, dimedion, etc, have not as yet been completely evaluated. This latter group has been found effective in the hands of some investigators where control with simpler drugs is not possible. However, for the present the practitioner will probably benefit most by awaiting more comprehensive and significant data on them.

Dilantin, tridione, phenobarbital, and mesantoin have specific indications and contraindications. Dilantin is most effective in the grand mal and psychomotor categories and is usually ineffective in petit mal. Tridione is used in petit mal and occasionally for psychomotor seizures, but usually is of no value in grand mal and may actually increase the number of this type of seizure. Phenobarbital and mesantoin, separately or in combination, frequently act as excellent adjuvants in the management of both grand mal and psychomotor seizures when given alone or with dilantin.

It is important to know that each of the drugs mentioned has a minimal effective dose as well as a maximal one which varies in different patients. This can only be determined by experiment and hence requires patience. It has been shown that the minimal effective dose of dilantin for the average adult is 0.3 gm. (4½ gr.) per day (usually given in three divided doses). The minimal effective dose of phenobarbital for adults is 0.1 gm. (1½ gr.), this given in one pill at bedtime. The minimal effective dose of tridione is 0.9 gm. (13½ gr.) best administered in divided doses, in capsules, each of 0.3 gm. (4½ gr.). Mesantoin is usually administered in doses similar to that of dilantin.

There is one important don't in the administration of most anti-epileptic drugs. With the possible exception of tridione, sudden withdrawal of medication is always contraindicated. If this is done the danger of exposure of the patient to status epilepticus is indeed a great one. If it becomes necessary to withdraw one drug, it should be done quite gradually over a period of a week to a month and should be substituted by another drug in full doses at the beginning of the program of withdrawal.

Status epilepticus implies recurrence of one seizure after another without recovery of consciousness in between. This condition requires heroic management. If status epilepticus should supervene, sleep therapy is indicated. The more common sleep-producing drugs employed are: paraldehyde, administered either intravenously, rectally, or orally; sodium phenobarbital or sodium amytal in doses of 0.5 to 1.0 gm. (7½ to 15 gr.) intravenously; avertin, drop ether, or chloroform may be effective.

TOXIC EFFECTS

All four drugs mentioned in the medicinal management of epilepsy do have some toxic effects in certain susceptible individuals in small doses and in almost all patients with the larger doses. In severe cases the effective dose may be very close to the patient's limit of tolerance. Some of the more common toxic or undesirable effects may be summarized as follows:

Phenobarbital—Rash and somnolence. Epileptic patients frequently build up an increasing tolerance to this drug from the standpoint of sleepiness. At times small doses of benzedrine sulfate may help combat excessive drowsiness.

Dilantin—The more common toxic symptoms include gastric distress, nystagmus, diplopia, incoordination, and tremor. Most of these symptoms are of little importance but if they prove to be continuously annoying, the dosage should be decreased. More severe symptoms are cutaneous rash and blood dyscrasia. The latter is an absolute indication for the complete withdrawal of the drug; the former usually appears within two weeks after initiation of therapy and disappears when the drug is withdrawn. In this case the drug frequently can be administered later in small initial doses and then gradually increased to the usual dose. Children frequently have annoying hyperplasia of the gums, which can best be prevented by frequent massage. However, once it makes its appearance, surgical excision is usually required.

Mesantoin—The toxic symptoms of this drug are very similar to those of dilantin.

Tridione—An occasional patient may have a rash or may experience fatigue, drowsiness, or stomach upset. A striking undesirable side effect is sensitivity of the eyes to sunlight, most commonly seen in older children and adults. A disturbing effect is that on the white blood cells; leukopenia may gradually occur over a period of months.

It is usually best to administer the anti-epileptic drugs in divided doses with or after meals. Most of these drugs tend to be irritating to the gastric mucosa in large doses.

The physician's ignorance or timidity has often robbed the patient of the benefit which he could and should have experienced. The most common cause of failure in the medicinal management of epilepsy is the impatience of the physician. In order to evaluate adequately any particular drug, the minimum period of observation should be at least a month and probably much longer. The so-called medical failures could be much fewer if the general practitioner would keep this in mind.

Between 10 and 25 per cent of epileptics will not

respond to the regimen described, and these are best treated in the larger clinics where experience with the newer drugs is of course greater.

It is important to remember that epilepsy in most cases is not a surgical disease. Brain tumors are present in less than 5 per cent of epileptics. The removal of tumors or scars does not guarantee a complete cure.

Between 60 and 80 per cent or more of epileptics can be controlled and made useful citizens of the community when treated intelligently. It is usually best to suggest that the patient not be employed in occupations which expose others or himself to danger, e.g.: (1) require him to operate a vehicle; (2) work in high, exposed places, or (3) manipulate complicated or exposed machinery.

Treatment of Acute Secondary Peritonitis

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THE treatment of peritonitis begins with prevention. This includes early diagnosis and prompt surgery for conditions which may lead to its development, such as appendicitis, peptic ulcer, diverticulitis, cholecystitis, intussusception, volvulus, pelvic inflammatory disease, liver abscess, malignancy, and penetrating abdominal injury. A careful aseptic operative procedure on a patient well prepared generally by replacement therapy for physiologic imbalance and well prepared locally by intestinal antiseptics will reduce the incidence of peritonitis whenever section of the gastrointestinal tract is performed.

The treatment of established acute secondary peritonitis is directed toward supporting the natural defenses of the body. Principles of treatment are twofold: (1) to isolate the focus surgically by means of excision or closure either with or without drainage, and (2) to combat infecting bacteria and their toxins. The therapeutic measures employed are both supportive and specific.

The aim of supportive therapy is to provide rest for the peritoneum, and thus to accomplish localization of the process. Supportive therapy includes (a) absolute bed rest, (b) gastrointestinal siphonage, (c) restriction of oral feeding, (d) avoidance of catharsis or enemas, and (e) sedation, to minimize distress and promote general physiologic rest.

Siphonage by the Levin or Miller-Abbott tube stops vomiting. With a properly functioning tube, accumulation of irritative intestinal material and gas is prevented and the severity of distention and ileus is minimized.

Nothing except sips of water or hot tea is allowed by mouth. Iced or carbonated drinks are avoided. Fruit juices are particularly avoided because of their gas-forming qualities. Parenteral alimentation is employed for restoration and maintenance of the water, chemical, and protein balance, by the administration of 3,000 cc. or more of fluids, chiefly 5 per cent dextrose solution. Not more than 9 gm. of sodium chloride per day is added unless vomiting has been severe. A urinary output of 1,500 cc. a day is essential.

During the period of decompression, blood, plasma, or proteins are used for the treatment of secondary anemia, shock, and hypoproteinemia, as indicated by serial hemoglobin, hematocrit, and copper sulfate specific gravity tests. Overhydration, which may lead to pulmonary and myocardial complications, must be avoided during this critical period. These measures are continued until signs of localization or returning function are evident. This may be five to seven days, or even longer, after treatment is begun.

Morphine sulfate, in the amount of 10 mg. hypodermically, may be used to promote rest and assist maintenance of bowel tone. The application of heat is of questionable value. Agents such as pitressin and prostigmine have not demonstrated any uniform degree of efficiency and are best avoided. Rectal examination to detect abscess is all too frequently neglected, and periodic use of a rectal tube may be very efficacious.

Pulmonary and circulatory complications frequently develop in the patient with peritonitis, particularly after surgery. Change of position every two or three hours during the day is essential not only to prevent depression of pulmonary function, but also to prevent circulatory stasis in the lower extremities and its possible sequelae. Deep breathing and leg exercises during this period are prophylactic. Tight dressings and supportive binders should never be applied so as to be uncomfortable and to restrict full expansion of the lower chest.

The specific therapy of peritonitis includes (1) surgery, and (2) chemotherapy. The treatment of acute secondary peritonitis is primarily surgical.

The earlier the operation the better, especially if provision is made for improvement of the patient's operability by preoperative parenteral administration of indicated liquids, including blood.

The commonest form of peritonitis follows acute appendicitis. When the diagnosis is certain, the muscle-splitting McBurney-type incision is preferred by many surgeons. When there is doubt, and when children are concerned, the right rectus muscle-splitting incision is used. The ruptured appendix should always be removed if it is accessible. The ruptured gallbladder is drained. Perforations of hollow viscera caused by trauma or inflammation should be closed whenever possible.

Surgical treatment of a perforated diverticulum or malignant process requires fine skill and even finer judgment. Excision or exteriorization are procedures of choice. If these are not practicable, adequate regional drainage is established and a proximal diversional colostomy is performed. Suction via intestinal intubation for surgical drainage is not an adequate substitute in such cases. Resection is required for gangrenous loops of bowel. Unless color and peristalsis return within five minutes following release of strangulating adhesions, intussusception, or volvulus, the involved bowel is regarded as compromised and resection is mandatory.

Adequate drainage of the peritoneal cavity for generalized peritonitis is impossible. When frank pus is present, aspiration of both lumbar gutters and pelvic recess before closure is simple and effective. Douching of the peritoneum is valueless, and is also meddlesome because it aids in further dissemination of infection.

A peritoneal abscess is best drained through a separate McBurney-type incision. Specific indications for drainage include: (1) large amounts of pus or necrotic material; (2) inadequate suturing; (3) poor hemostasis, and (4) involvement of the retroperitoneal spaces. In instituting drainage, it must be remembered that (1) cigarette drains drain poorly, (2) hard tubes may cause erosion in surrounding structures by pressure or intestinal obstruction if they are placed among loops of bowel, (3) tight closure defeats the purpose of a drain, and (4) tube drainage is progressively less effective with time, and once a tract has formed, acts as a foreign body. Tube drainage for three days is usually adequate.

The value of systemic chemotherapy as an adjuvant to surgery in the treatment of peritonitis is now generally recognized. Acute septic peritonitis, according to present concepts, is caused by gram-positive organisms, chiefly anaerobic cocci and rods, in symbiosis with Escherichia coli and other gram-negative bacteria. Chemotherapy, accordingly, is directed primarily against the gram-positive bacteria.

Penicillin alone, in a total daily dosage of 1,000,000 units or more, is very effective. The large doses are necessary because of the production of penicillinase by coliform bacteria. When penicillin is combined with 2 gm. daily of streptomycin which acts mainly on the penicillinase-producing gram-negative bacteria, the results of specific therapy are even more immediate and lasting.

Sulfadiazine, in doses of 5 gm. daily is a proved, valuable adjunct. The combined use of all these agents has given optimum results in our hands and is recommended.

Chemotherapy is instituted in the operating room or before, and is continued until two days after the patient is afebrile. Scientific proof is lacking in support of the efficacy of sulfonamides and antibiotics placed in the peritoneal cavity.

The new antibiotic, aureomycin, gives promise of being another efficient drug for the treatment of peritonitis. It promises to supplant streptomycin for this purpose, either alone or with penicillin. The dosage recommended is 1 to 2 gm. a day, given by mouth at six-hour intervals. To date, no serious toxic phenomena have been reported attributable to aureomycin therapy. Terramycin, a recently introduced antibiotic, may be a valuable adjunct to surgery in peritonitis.

Abscess formation is a common complication of peritonitis. Peritoneal abscesses in some locations may drain spontaneously; others, if small, may resorb. For this reason, surgical drainage of an abscess is often postponed until access to it has become easy. Constant observation for spread of the infection or rupture of the abscess is absolutely necessary. If either complication develops, immediate operation is indicated. If the mass fails to show recession in size and signs after several days of treatment, operation is also indicated. Supportive measures are continued until the signs of peritonitis have disappeared.

Following recovery from the initial insult, reexamination during the first weeks of the convalescent period is essential. This examination should always include a rectal digital evaluation. Reformation or reactivation of an abscess seemingly properly controlled by antibiotic therapy may occur. We have seen several such cases. Adequate early chemotherapy may obviate additional surgical procedures.

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EDITORIALS

Postgraduate Medicine OFFICIAL JOURNAL OF THE INTERSTATE POSTGRADUATE MEDICAL ASSOCIATION OF NORTH AMERICA — ORGANIZED IN 1915

Editor-in-chief: CHARLES W. MAYO, M.D.
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NOVEMBER 1950

HUMAN ADAPTATION TO SEMISTARVATION

People who reduce weight often get to a point approximating starvation. At the University of Minnesota, the Laboratory of Physiologic Hygiene has been conducting a long term experiment on semistarvation with the cooperation of 32 conscientious objectors who were resident in the laboratory for a year.

For three months these volunteers were subjected to studies of their metabolism after which they underwent six months of semistarvation. Then they were studied during three months of rehabilitation. During the preliminary study they ate a diet adequate in protein, vitamins and minerals but without excessive amounts of any special nutrient substance. They maintained their body weight on 3,492 calories per day, with activities that included simply housekeeping chores and 20 miles of walking each week. The semistarvation diet provided 1,570 calories daily and included potatoes, cabbage, turnips and cereals with only a few grams of animal protein a week. This diet resembled the amount used in famine in northern Europe. The diet provided 54.5 gm. of proteins and 27.1 gm. of fat daily with the vitamins and minerals usually included in a good diet except that the intake of riboflavin and vitamin A was about half the recommended standard.

At the end of six months on this diet all of the young men had lost 24 per cent of their body weight and all of them had developed the symptoms of famine, including swelling from accumulation of water in the tissues, anemia, slow heart beat, weakness and depression. During the progress of this study, the investigators were able to determine the manner in which the body adjusts itself to famine. The starving body must use some of its own protein for fuel. The brain tissue loses a smaller fraction of its usual weight during a period of severe starvation whereas fat, muscle, liver and skin in the body undergo large losses. The heart also undergoes a considerable loss of muscle mass during acute and chronic starvation. However, the body makes adaptations which safeguard the heart. The work done by the heart decreases about 50 per cent as a result of starvation.

The Minnesota experiment shows that the changes in the body enable it to meet the new situation more effectively than would otherwise be the case. The adaptations that occur in stressful situations are generally

compromises. The changes due to semi-starvation permit man to meet the altered situation produced by great restriction of calories with moderate success. One of the most important aspects of the study from a practical point of view is the indication that rigid dieting over brief periods of time cannot do serious harm to the human body because of the factors of safety that lie within the body itself.

MORRIS FISHBEIN

POISONING BY ASPIRIN

ASPIRIN is now generally believed to be the safest drug for relief of ordinary pain and is, in fact, generally accepted as a home remedy. Nevertheless cases of poisoning by aspirin have been reported and authenticated. The symptoms include dizziness, ringing in the ears, deafness, nausea, vomiting, fever, rapid pulse, profuse perspiration with subnormal temperature, and eventually coma. The effects of salicylates on the blood and urine in large doses may bring about the presence of albumin, casts and blood cells in the urine, and sometimes acetone. Cases of sensitivity to aspirin have also been described in which the symptoms are severe.

Actually estimates indicate that sensitivity to the drug does not occur more frequently than two out of a thousand people and perhaps even less frequently.

Recently Dr. Leon A. Greenberg[1] has evaluated the reported poisonings by acetylsalicylic acid and has preceded his evaluation by a competent review of some 96 articles on the subject previously published in medical periodicals. According to this survey only 88 cases of poisoning by aspirin have been reported with sufficient data to permit scientific evaluation. In one-third of these cases the drug was taken in attempted suicide and massive amounts were involved, including over 12 gm. or 180 gr. in a single dose in 38 cases. A relatively small number of poisonings followed prolonged, repeated consumption of the drug with lesser amounts. The survey indicates that a fatal dose of acetylsalicylic acid for man is exceedingly large. Several authorities in the field of toxicology write that they have never seen a death result from an overdose of aspirin. In 1940 the London *Lancet* reported the occurrence in England and Wales of between 33 and 65 cases annually.

The analysis by Greenberg covers 31 cases of deaths attributed to acetylsalicylic acid with sufficient data to warrant an opinion. Of these 31 cases, 11 were cases of suicide in which quantities of the drug ranging from 20 to 75 gm. were taken at one time. Instances are reported of a man who took 50 gm. of the drug at one time, supposedly for a toothache and of another instance of a patient who took 60 gm. or 1,000 gr. of aspirin at a single dose. Anyone can calculate that this means 200 five-grain tablets.

The conclusion of Doctor Greenberg seems warranted that there is a conspicuous absence of reports of serious poisoning or death, other than allergic poisoning, associated with the ordinary use of aspirin even when the drug is taken over a long period of time.

MORRIS FISHBEIN

1. GREENBERG, LEON A., PH.D.: An evaluation of reported poisonings by acetylsalicylic acid. New England J. Med., July 27, 1950, p. 124-129.

WHOOPING COUGH

IN 1949, for the first time in the history of the United States, less than 1,000 deaths occurred from whooping cough. The final figure, which will come from the Bureau of the Census, may be as low as 800. The figure is especially striking according to the Statistical Bulletin of the Metropolitan Life Insurance Company* because it comes at a time when the birth rate of the country has reached a figure of nearly 4,000,000 annually. The number of cases of whooping cough each year approximates 75,000 and

*"The Conquest of Whooping Cough," Statistical Bulletin, Metropolitan Life Insurance Company, 31:8 (July) 1950.

before 1930 was apparently never less than 150,000.

Authorities are inclined to credit most of the advance to the use of preventive inoculations against the disease. The new vaccines have become available only during the last quarter century. When their efficacy was established, their use was recommended by the American Academy of Pediatrics as routine. Now several of the newer antibiotics have been found effective in whooping cough—notably streptomycin and aureomycin. Coupled with the use of these antibiotics is improvement in management of the disease, including good nursing service, the use of oxygen when there are respiratory difficulties, technics for aspirating material from the bronchial tubes, control of water balance in the body, feeding technics and the use of convalescent serums.

The death toll now includes chiefly exceedingly young infants in whom the complications affecting the central nervous system are sometimes fatal. The peak of deaths is found in the second, third and fourth months of life, usually before the age when successful immunization against whooping cough is possible. The proposal has been made that inoculation against whooping cough be done before three months of age. Research as to the desirability and possible incidental complications of such inoculation is now in progress. Certainly in the presence of a serious epidemic, the inoculation of exceedingly small infants must be considered.

MORRIS FISHBEIN

MARRIED WOMEN LIVE LONGER

Recently published statistics indicate that both men and women in the United States have increased their expectancy of life considerably since 1900. The gains are more pronounced for women than for men, and married women are healthier than the single ones. The women have benefitted primarily by pronounced drops in the death rates from tuberculosis, pneumonia and maternity, and that is probably the reason why the married women have done better than the single ones.

For the last fifty years married men have enjoyed a lower mortality than unmarried men at every age period. Experts for a large insurance company[1] point out that the large reduction in the mortality among married people has added immeasurably to the stability of family life, especially in the earlier years of marriage when death of a parent means dependency—sometimes even delinquency—for the children.

The great improvement in life expectancy for women has greatly increased the chances that a woman will outlive her husband. A married woman will outlive her husband and having outlived him, she can be a widow for a longer time. The insurance companies emphasize the fact that married men should take more interest in providing economic security for those they leave behind.

MORRIS FISHBEIN

1. Statistical Bulletin, Metropolitan Life Insurance Company 31:1 (April) 1950.

DOCTORS' HOBBIES

Many volumes have been written about the many pursuits followed by physicians in their times of leisure. Many physicians have gained fame in fields far removed from medicine. Conspicuous examples are physicians who were or are writers: Somerset Maugham, Warwick Deeping, Francis Brett Young, A. Conan Doyle, Chekhov, Arthur Schnitzler and Claude Duhamel. Dr. Alfred S. Warthin, distinguished as a pathologist, wrote also about rock gardening. Dr. Martin Fisher, famous for his knowledge of colloids, is equally famous for his contributions to the making of paints. Competent in sculpture was R. Tait McKenzie; Elie Faure wrote one of the most noteworthy works of the twentieth century on the history of art.

I once made a survey of the hobbies of some hundreds of doctors taken at random—458 played golf, 296 as against 26 preferred

bridge to poker, music interested 108, reading 381, chess 52, writing 24, the drama 32 and mountain climbing 10. Among the famous physicians who had music as a hobby were Casper Bartholinus who was familiar with the Greek double flutes, the clarinet and the oboe; John Arbuthnot who wrote sacred anthems; Herman Boerhaave who composed chamber music; Leopold Auenbrugger who composed an opera; Joseph Hyrtl who sang as a professional; Borodin who composed opera; Edward Jenner who played the violin and flute; and Jacob Henle who played the violin and violin cello and who played in string quartets. Incidentally the famous Billroth played in quartets with Brahms.

To the list of modern writers that I have mentioned may be added R. Austin Freeman, noted in the field of detective story writing, and such classical writers in English as Smollet, Goldsmith, Lever and Oliver Wendell Holmes. Such names as those of Keats and Robert Bridges bring fame to the medical profession in their stature as poets.

MORRIS FISHBEIN

JOHN ELBERT O'KEEFE, M.D.

September 6, 1871 — September 16, 1950

PIONEER surgeon; humanitarian; distinguished citizen; Trustee, Interstate Postgraduate Medical Association, 1918-1919 and 1923-1950; born on a farm near Jessup, Iowa, on September 6, 1871; M.D., Iowa State University School of Medicine, 1896; postgraduate training in surgery at New York Postgraduate Medical School; postgraduate training in thyroid surgery under Dr. Theodore Kocher, Berne, Switzerland; Member, Iowa Surgical Society; Fellow, American College of Surgeons, 1923; Member, American Association for the Study of Goitre; Member of the Iowa State Medical Society; Member of the American Medical Association; President of the Staff of St. Francis Hospital, Waterloo, Iowa, and Member of the Surgical Staffs of the Allen Memorial Hospital and the Presbyterian Hospital, Waterloo, Iowa; Consulting Surgeon for the Northeast District of Iowa Draft Board, World War II; Trustee of Loras College, Dubuque, Iowa; President of the Interstate Postgraduate Medical Association, 1921-1922; Knights of Columbus; Order of the Knight of St. Gregory, 1946.

The Medical Bookman

► THE MERCK MANUAL OF DIAGNOSIS AND THERAPY - - -

Edition 8, 1,592 pages, Merck & Co., Inc., Rahway, New Jersey, 1950. Regular edition $4.50; thumb-index edition $5.00.

One of the most amazing products in the field of medical publication, which is reported to have sold more than 75,000 copies in advance of publication, is Merck's Manual. The present edition is an outgrowth of a little handbook distributed many years ago largely to promote the use of products manufactured by Merck. Now the volume resembles most the "Handbook of Therapy" published for many years by the American Medical Association and during its period of existence the most popular book of its type in the United States.

The present edition of the Merck Manual has been revised by an editor with the assistance of an editorial board. New chapters include those on nutritional deficiencies, radiation reaction and injuries, allergies and antihistamines, psychoneurosis. drug addictions, the care of the premature infant. pre- and postnatal care, and dental emergencies.

The second part provides new chapters on routine immunization measures, clinical and bedside procedures, laboratory tests for the physician's office, a section on diets and many tables and lists of immediate practical importance.

Among the new drugs first introduced at this time are many antibiotics, vitamin B_{12}, ACTH and cortisone, and the antihistaminics.

Here is about the most practical book that any general practitioner could have and should have.

M. F.

► GYNECOLOGY - - -

By John I. Brewer, B.S., M.D., Ph.D., Professor of Obstetrics and Gynecology, Northwestern University Medical School; Chief of Gynecology and Obstetrics, Passavant Memorial Hospital, Chicago. 437 pages, illustrated. 1950, Thomas Nelson & Sons, New York, Edinburgh & Toronto. $7.50.

The usual method of didactic presentation is discarded in this new textbook of gynecology. Instead of presenting individual entities, the author has organized his material into groups of symptoms and findings. The first four chapters deal with pelvic tumors in relation to pain, and bleeding without tumor, while the remaining chapters deal with other symptom complexes such as dysmenorrhea, dyspareunia, leukorrhea, incontinence, etc.

The author states his purpose in presenting this text as an arrangement of gynecologic entities and related conditions in a manner best suited for diagnosis, therapy and teaching. The postgraduate student and the practitioner of gynecology should find the text most valuable as a transition from the didactic approach to the consideration of the patient as a clinical entity. The text is well written. easily readable and carefully indexed.

M. B. S.

► MANUAL OF RHEUMATIC DISEASES - - -

By W. Paul Holbrook, M.D., and Donald F. Hill, M.D., Tucson, Arizona. With the assistance of Charles A. L. Stephens, Jr., M.D. 182 pages, with 119 figures. 1950, The Year Book Publishers, Inc., Chicago. $4.25.

The advent of such compounds as ACTH and cortisone advancing the hormonal approach to the therapy of arthritis has aroused a renewed interest in the rheumatic problem. The astonishing results presented originally by medical authors and immediately grossly misrepresented by lay publications and newspaper articles have forced almost every practitioner to develop a practical approach to the various rheumatoid and related syndromes. Presently a state of misinformation, exaggeration of successes and overstatement of therapeutic possibilities prevails.

This monograph is published to be used quickly and easily as a guide to the diagnosis and treatment by any interested physician. The clinical approach is well controlled and substantiated by accurate follow-up and laboratory studies after a trial run of one year. The remission in the activity of rheumatoid arthritis is dramatic in some instances, but the claims of the restoration of destroyed joints, correcting deformities, and the like, have not been verified. The dosage, toxic reactions, and clinical response are proferred for brief review.

In general this is a lucid treatise by well qualified authors who have attempted to separate the "miraculous results" from the "terrible hazards." The theme to prevent deformities while the research goes on becomes convincingly vital, as the mechanism of remission may soon be determined.

H. O'P.

► WORLD SURGERY 1950 - - -

By Stephen A. Zieman, M.A., M.D., F.A.C.S., F.I.C.S., Abstract and News Editor, Journal of the International College of Surgeons, Abstractor for International Abstracts of Surgery and Surgery, Gynecology & Obstetrics. 177 pages, with 53 illustrations. 1950, J. B. Lippincott Company, Philadelphia, London & Montreal. $6.00.

This volume presents a brief review of the significant changes in the field of surgery during the past year, as recorded in the medical journals throughout the world.

In a series of abstracts, the book reviews in order the surgical diseases of each organ or system of the body. In this manner it deals first with the problems of the general surgeon; thereafter those of the gynecologist, obstetrician, orthopedist, urologist, neurosurgeon, ophthalmologist and otolaryngologist, and includes a few less common, miscellaneous problems.

The nature of its literary construction makes it interesting to the surgical specialist who would desire a working knowledge of surgical problems beyond his specific field of interest. In like manner, it should be of interest to the general practitioner who takes pride in being versed in a wide field of surgical problems.

The journal, author and subject indices are adequately documented and 53 well chosen illustrations demonstrate pertinent factors.

C. O. R.

► HANDBOOK OF PHYSICAL MEDICINE AND REHABILITATION - - -

By The Council on Physical Medicine and Rehabilitation of the American Medical Association and 29 Contributors. 573 pages, with 56 illustrations and 25 tables. 1950, The Blakiston Company, Philadelphia & Toronto. $4.25.

The recent advances in physical medicine and its apparent inter-relationship with the final rehabilitation of the patient have projected a newer all-inclusive specialty onto the medical horizon. This handbook arises from the combined efforts of the two closely correlated groups and is established as a vehicle for the dissemination of the knowledge related to their fields. Now regarded as a comprehensive specialty under the joint terminology of Physical Medicine and Rehabilitation, the endeavors of each have been consolidated and ultimately directed to achieve maximum function and adjustments of the individual.

The book is extensive and assays all forms of physical medicine used in the treatment and diagnosis of disease by non-medical means. Each type of physical therapy is described separately in a particular chapter, reviewing recent valuable clinical and laboratory studies and amalgamating them with the well established treatments of the past. Discussed expertly by authors foremost in the field, it is a necessary addition to the library of anyone having an interest or association with the field. Others more concerned with the final result from a practical standpoint will utilize it as a reference in formulating an opinion.

The various agents of physical medicine are first surveyed individually and then with relevancy to the diversified specialties. Prepared to keep pace with the new developments in physical medicine and rehabilitation, the book fulfills the intention and renders a superior criterion for future editions.

H. O'P.

► MODERN PRACTICE IN DERMATOLOGY - - -

Edited by G. B. Mitchell-Heggs, O.B.E., M.D., F.R.C.P., Physician-in-Charge, Skin Department, St. Mary's Hospital and Medical School, London; Physician, St. John's Hospital for Diseases of the Skin and Institute of Dermatology, University of London. 836 pages, with 319 figures and 7 color plates. 1950, Paul B. Hoeber, Inc., New York. $12.50.

There is no textbook of dermatology which handles every phase of the subject thoroughly, but the present text covers the more common skin conditions adequately, and rare dermatoses rather well.

This book is well divided into chapters and subdivisions so that the subject matter can be found easily. The list of contributors is a formidable one. Although this is a British textbook, the presentation and therapy are universally acceptable. The book is well illustrated with a total of 319 illustrations and seven colored plates.

Some of the outstanding features include a proper method of examining the patient, principles of treatment, the handling of allergy, and dermatologic disorders with their psychosomatic relationships. There is, however, practically no histopathology included.

On the whole, the book is well presented and can be recommended as a satisfactory reference text.

I. F.

► A TEXTBOOK OF GYNECOLOGY - - -

By Arthur Hale Curtis, M.D., Emeritus Professor and Chairman of the Department of Obstetrics and Gynecology, Northwestern University Medical School; and John William Huffman, M.D., Associate Professor of Obstetrics and Gynecology, Northwestern University Medical School; Attending Gynecologist, Passavant Memorial Hospital, Chicago. Ed. 6. 799 pages, with 466 illustrations, chiefly by Tom Jones, including 37 in color. 1950, W. B. Saunders Company, Philadelphia & London. $10.00.

The sixth edition of this popular textbook presents further revision, new illustrations and new material. The senior author, who has withdrawn from active medical teaching, has shared the preparation of this edition with Dr. Huffman.

The chapter on the embryology of the generative organs has been extensively rewritten as has that on urinary tract problems in gynecology. New material includes discussion of mesonephric remnants of the uterus, sarcomatous growth of cervical stroma, Papanicolaou and Traut tests for cancer, and the newer antibiotics in the treatment of inflammatory disease.

The text retains the original illustrations which are particularly excellent in the chapters on anatomy and embryology. The format of the text has been improved in the arrangement of chapter titles and in the readability of the type.

As a comprehensive treatise on both academic and clinical phases of the subject in proper balance, this text should retain its value to medical students and clinicians alike.

M. B. S.

Books received will be acknowledged in this department each month. As space permits, books of principal interest to our readers will be reviewed more extensively.

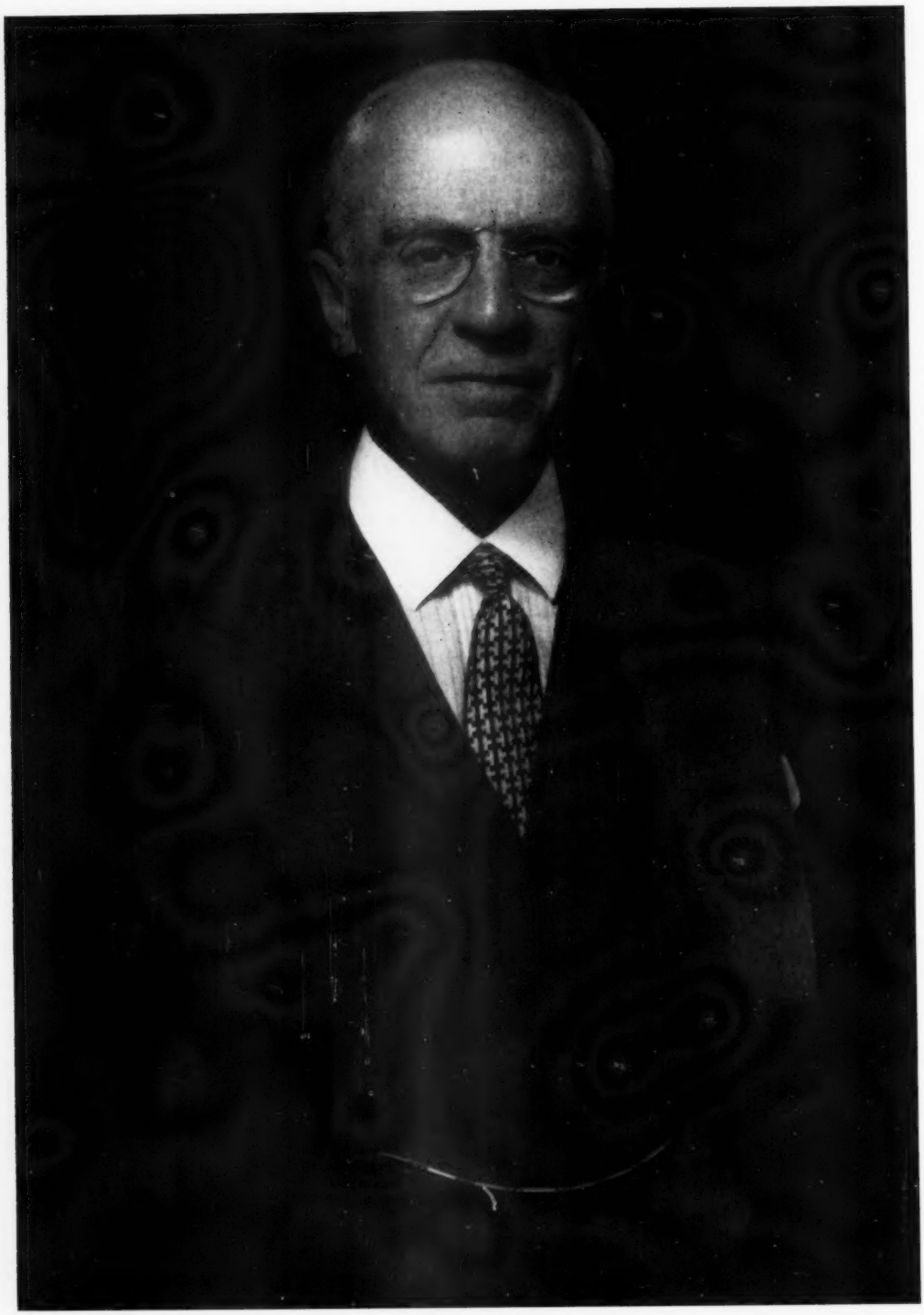
Pathologic Physiology; Mechanisms of Disease. Edited by William A. Sodeman, M.D., F.A.C.P., The William Henderson Professor of the Prevention of Tropical and Semi-Tropical Diseases, Tulane University of Louisiana School of Medicine; Senior Visiting Physician, Charity Hospital of Louisiana; Consultant in Medicine, U. S. Marine Hospital, New Orleans. 808 pages with 146 figures and 30 tables. 1950, W. B. Saunders Company, Philadelphia & London. $11.50.

Disorders of the Blood. By Sir Lionel E. H. Whitby, M.D., F.R.C.P., D.P.H., University of Cambridge; and C. J. C. Britton, M.D., D.P.H., Bland Sutton Institute of Pathology, The Middlesex Hospital, London. Ed. 6. 759 pages, with 94 illustrations and 12 color plates. 1950, The Blakiston Company, Philadelphia & Toronto. $8.00.

An Atlas of Human Anatomy. By Barry J. Anson, Ph.D., Professor of Anatomy, Northwestern University Medical School. 518 pages. 1950, W. B. Saunders Company, Philadelphia & London. $11.50.

Doctor, Come Quickly! By Frank J. Clancy, M.D., Seattle, Washington. 248 pages. 1950, Superior Publishing Company, Seattle. $2.95.

Thoracic Surgery. By Richard H. Sweet, M.D., Associate Clinical Professor of Surgery, Harvard University Medical School. Illustrations by Jorge Rodriguez Arroyo, M.D., Assistant in Surgical Therapeutics, University of Mexico Medical School. 345 pages with 155 illustrations. 1950, W. B. Saunders Company, Philadelphia & London. $10.00.



In all things, a sense of proportion. . . .

Men of Medicine

"You Must Do Everything with Love"

During World War II, a young U. S. doctor just out of medical school was captured by the Japs. A missionary's son, he spoke Chinese and so was suspected of being a spy. He was taken to Japan, where the Japs gave him the "water cure" and tortured him in other ways to force a confession. He was put into a dungeon that had only one window; with nothing to read, he thought he would lose his mind. Then a Japanese doctor came to see him; a graduate of the University of Washington in the U. S., he turned out to be a decent sort who asked the captive if he could do anything for him. Above all, the young American doctor wanted something to read. The Jap promptly and proudly trotted back with Cecil's "Textbook of Medicine." During his captivity the prisoner just about memorized the hefty volume. Today, says its editor, Dr. Russell L. (for LaFayette) Cecil, his grey eyes humorously bright behind rimless glasses, the ex-captive is "a darn good doctor—maybe that's the reason!"

Cecil's textbook is like that, and so is Dr. Cecil (the "e" is pronounced long). Handsome, slim and athletic, he has an immense enthusiasm for living, for medicine, and for his book. His wife, Eileen Cumming Cecil, whom he married in 1923, says that each edition is like a new child to him, "the youngest always being the best beloved." The current "best beloved" is the seventh edition, but Dr. Cecil is now at work on the eighth.

Dr. Cecil, who was 69 in October, has always kept in mind some advice given him early in life by his father, the Reverend Russell Cecil, a distinguished minister in the Southern Presbyterian Church. He likes to quote it when he has to make commencement speeches. It goes like this: "Everything you undertake in life you must do with love; no matter how humdrum the task, bring to it all your enthusiasm, your passion for achievement."

It was under that banner that Dr. Cecil tackled the work of compiling his great textbook. He became aware of the need for it in the early 1920's while assistant professor of clinical medicine at Cornell University Medical School, when it was in downtown Manhattan near Bellevue Hospital, before it moved to its present impressive uptown quarters in the Cornell University-New York Hospital Medical Center. Once a week he gave his students quizzes based largely on Osler's "Principles and Practice of Medicine." Osler had died in 1919, and his book was getting a bit out of date. Dr. Cecil felt the need for a more modern textbook on medicine.

Medicine was changing fast 25 years ago and what was required, he thought, was a brand new one-volume text that started from scratch, and in which each disease would be discussed by an authority on that subject. So he went to the publishing house of W. B. Saunders Company and talked over the idea. The publishers agreed it was a good idea if he could find the right men to write on their special interests. He tried to get men who were "in love with the disease," men for whom "the disease had become their middle name."

The book with its 150 authoritative articles got only a "moderately warm" reception from reviewers when it first appeared, but it soon became *the* textbook, gaining prestige as great as Osler's. Today it is a required text in 86 per cent of all medical schools in the U. S., and has been translated into Spanish and Portuguese (two volumes each) and into Chinese; the only part of the Chinese edition Dr. Cecil can read is his name on the title page, which is in English letters; it is now being translated into Persian.

In assigning himself articles in his textbook, Dr. Cecil departed only slightly from his idea of finding men in love with specialties. He undertook to clean up odds and ends and he wrote two long, important sections—one on arthritis and one on the pneumonias—from his own enthusiasm.

Pneumonia was the first of his great long-lasting personal enthusiasms, and in this disease he made one of his outstanding contributions to medicine. His interest was alerted during World War I. He entered the Army on June 16, 1917, as a first lieutenant; by 1918 he was a major. He was made director of the laboratories at Camp Upton, New York, and also at Camp Wheeler, Georgia, and from 1917 to 1919 he was head of the Surgeon General's Commission to Study Pneumonia. Pneumonia was, of course, a catastrophic problem in World War I, especially during the great influenza epidemic of 1918-1920; but neither pneumonia nor 'flu was a major problem of World War II—why, says Dr. Cecil, no one knows.

While working with the Bacteriological Laboratory of the Army Medical School in Washington, Dr. Cecil and his associates became the first in the U. S. to use prophylactic vaccine against pneumonia. It had been tried before among the pneumonia-ridden native workers in diamond mines

in South Africa, but nowhere else. Dr. Cecil saw the need for doing something about pneumonia while at Camp Upton and Camp Wheeler, where the mortality rate was high. A Pullman car was converted into a laboratory and spotted at the end of troop trains moving between the two camps; it was, says Dr. Cecil, the first and last time he ever had the use of a private car. Dr. Cecil and his associates vaccinated nearly 25,000 troops at the two camps with "striking results."

Chief points of the work were published in a series of ten monographs in *The Journal of Experimental Medicine* in 1920, written in collaboration with Dr. Francis G. Blake, now dean and professor of medicine at the Yale University School of Medicine, under the general title "Studies on Experimental Pneumonia." Dr. Cecil was helped greatly in his work by having the use of 400 Philippine monkeys. He still recalls those days with pleasure. The monkeys, he says reminiscently, were "as big as dogs," and "nobody ever had so many monkeys to work with." He has an artist's enthusiasm as he looks at the monograph's striking illustrations of lung sections and speaks of the "beautiful pathology" and the "lovely pneumonia." The monkeys with pneumonia reacted much like human beings, both in fever and leukocyte counts. The monkeys were given pneumonia, and then cured with serum—the work that was in part responsible for the later successful treatment of human beings.

The animal experiments helped to clear up the way people get pneumonia, how the germs get down into the lungs—in other words, revealed the cause of pneumonia. This work and other studies that followed were in part responsible for establishing the serum treatment of pneumonia and, as Dr. Cecil recalls in his *Cecil* article, the formerly high mortality figure for pneumonia "was favorably affected for certain types of pneumonia by the introduction of antipneumonococcus serum." These ten papers are still frequently referred to in the literature and the preventive vaccines, now improved, are ready to be used again in case of a threatened pneumonia epidemic.

During the decade following World War I, Dr. Cecil continued his investigations on pneumonia in the wards of Bellevue Hospital. Alternate cases of pneumonia were treated with serum or with various antibody solutions. Even numbers received the serum; odd numbers had none and served as controls. Several hundred cases of pneumonia were studied in this way. When the final figures were analyzed it was quite evident that serum and its various modifications were capable of cutting the fatality rate of pneumonia about in two. There were, of course, obvious disadvantages to serum treatment. There were dangerous reactions, and the serum was not nearly so effective as the sulfonamides and penicillin later proved to be.

As a kind of medical byproduct of his interest in pneumonia, Dr. Cecil got excited about the common cold, and wrote a popular book, "Colds: Cause, Treatment and Prevention," published (by D. Appleton & Co.) in 1925. He discussed colds with a proper seriousness, writing: "Not only pneumonia and pleurisy, but meningitis, mastoiditis, infections of the sinuses, bronchitis and asthma are usually traceable to preceding colds. Some of the chronic infectious diseases such as pulmonary tuberculosis and chronic arthritis often date their onset to the same cause." In the book he mentioned with skeptical optimism the chlorine treatment for colds, which became popular after World War I, when workers in a chlorine plant seemed to develop fewer colds than would have been expected. The chlorine treatment, he explains now, "just petered out."

Will the present rage for using antihistaminic drugs for colds peter out, too? The antihistamines, he thinks, will prove to have quite a limited field. The drugs, he thinks, may relieve some symptoms, but he doubts that they will stop a true cold. He has no plans for revising his early popular book on the common cold, but he is working on a scientific article on acute respiratory infections for *Postgraduate Medicine*. He has cleared up to his own satisfaction one mysterious statement he left hanging in his 1925 book: "Strangely enough, acute tonsillitis is frequent in newly married persons, a phenomenon that no one has been able to explain." It is due, he now thinks, to the excessive affection that often accompanies honeymoons, when the bridal couple exchange infections as well as kisses.

Gradually, Dr. Cecil's chief interest shifted away from pneumonia. Pneumonia, in fact, was pretty well shot out from under him as a major problem—the death rate now is about one sixth of what it was 40 years ago—and he helped to do the shooting. He had been one of the pioneers in the serum treatment that was the best answer to pneumonia in the 1930's, and then became one of the first doctors in the U. S. to use sulfonamide drugs against pneumonia. He could not pioneer in penicillin because at first the antibiotic was restricted to members of the armed services and it was hard to get for civilians. With the coming of the sulfonamides, closely followed by penicillin, he felt that the pneumonia problem was pretty well settled and turned his attention to his second great lasting interest in medicine, arthritis. He has always felt that it is one of the most dreadful diseases: "It does not kill—it destroys."

Here, too, Dr. Cecil made fundamental contributions. In 1922 he initiated, at the old Cornell Clinic, one of the first arthritis clinics in the country. In 1931 he and two associates (Nicholls and Stainsby) first demonstrated agglutinins for the *Streptococcus hemolyticus* in the serums of patients

Dr. Cecil . . . an immense enthusiasm for living, for medicine, for his book.

with rheumatoid arthritis. He does not believe, however, that rheumatoid arthritis is necessarily due to the *S. hemolyticus*. The implications of his findings are still being studied in other medical laboratories.

Dr. Cecil was one of the first in this country to use gold salts for arthritis—a treatment that is still being used in these days of ACTH and cortisone. Dr. Cecil feels that gold therapy is still a good treatment, although not as brilliant in its effects as ACTH and cortisone. He was not identified with experimental work in the newer hormones, but has no dog in the medical manger attitude; he believes that the hormones will eventually revolutionize the treatment of arthritis and uses them in his own practice. There are "many kinks" to be worked out, he thinks, but he has great hopes, and was impressed by reports at the San Francisco meeting of the A.M.A. that cortisone could be given successfully by mouth. The big problem now, he feels, is "weaning" patients away from the hormones and finding the right maintenance doses.

Dr. Cecil can afford now to look back and smile gently at the enthusiasm he and most other doctors showed for the theory of focal infection to explain arthritis and many other diseases. In a paper delivered in October, 1928, and later printed in the *Bulletin* of the New York Academy of Medicine, he said: "I believe that anyone who will study infectious arthritis in its early stages, that is, when it presents itself in the outpatient clinic, will be forced to accept the theory of focal infection. In its earlier stages, infectious arthritis is nearly always associated with a focal infection or at least with a history of focal infection. The removal of such foci . . . usually leads to recovery from arthritic symptoms. . . . I will hazard the statement that if the original focus of infection is removed during the first six months of the disease, the patient will recover in a high percentage of cases."

But a few years ago at a meeting of the Interstate Postgraduate Medical Association of North America he delivered a paper on "The Rise and Fall of Focal Infection." He said then that tonsils, for instance, should be removed only if badly infected or if the infection were spreading to the ear, and that only very bad teeth should be removed; but their removal, he warned, should not be expected to cure arthritis or other diseases. Then the discussant of the paper, a friend of Dr. Cecil's, suggested slyly that the paper should have been called "The Rise and Fall of Dr. Cecil." Dr. Cecil enjoyed the joke as much as the rest of the audience. Ten years after the New York Academy of Medi-

cine paper was delivered he found, as he reports in the current *Cecil,* that evidence of focal infection turned up in only 20 per cent of 200 cases of rheumatoid arthritis and that removal of the foci rarely produced any direct benefit. Getting rid of focal infections, Dr. Cecil now thinks, is a good idea for a patient's general health, but it does not necessarily have anything to do with curing the disease that is bothering him.

In his 43 years of practice Dr. Cecil has seen many medical fashions come and go. The all-out attack on teeth and tonsils was only one of them. After the focal infection rage came the vaccine era, but now vaccines are a comparatively small part of a physician's practice. There was the fad for colonic irrigations, for physiotherapy, for water treatments. In pneumonia he has watched progress from nonsense to science. At one time fresh air was the thing. No matter how cold it was, doctors thought they had to get the patient full of fresh air. It might be zero, and the cold might endanger the doctors and nurses as well as the patient, but the pneumonia victim had to be moved out to an unheated sleeping porch, or the windows of his bedroom had to be opened wide and the heat turned off. Then came oxygen therapy, which still has much value but is not the sure cure it once seemed. Then the serums, which Dr. Cecil did so much to develop. Then sulfonamides, which helped a lot but proved to be so toxic that they are now little used in treating pneumonia. Finally, penicillin, which made all other treatments just about obsolete. Penicillin for pneumonia, Dr. Cecil thinks, is no fad but a treatment that will last; it is "an almost perfect remedy" and he says it is hard to see how anything better could ever be developed. The great majority of pneumonias are controlled now by penicillin, and other antibiotics such as aureomycin and terramycin are proving helpful in virus pneumonias.

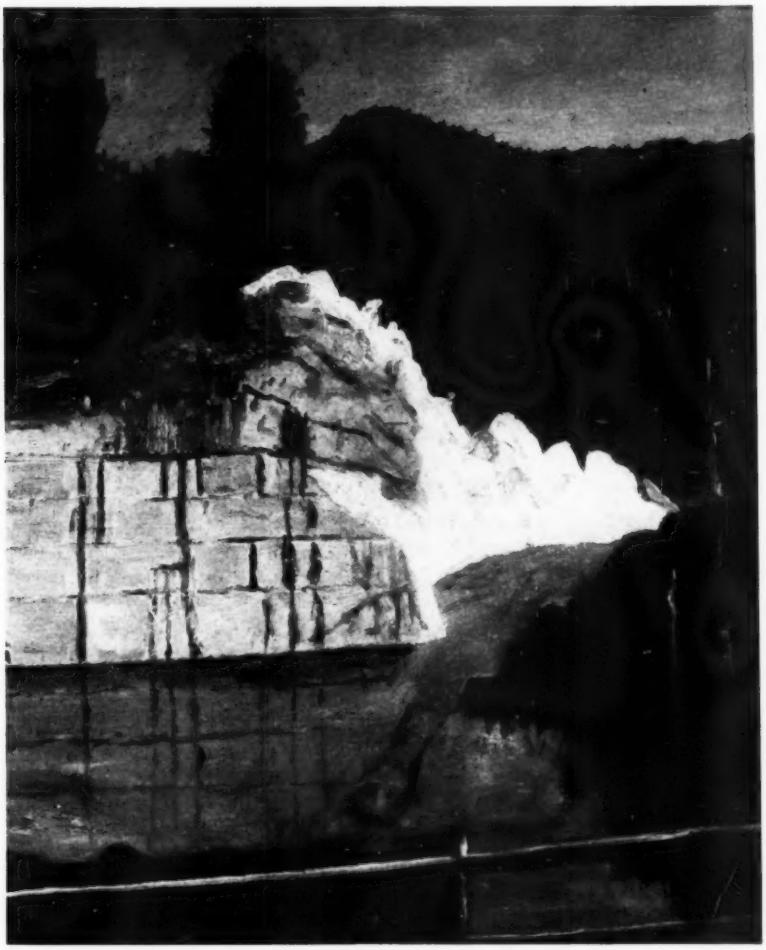
Dr. Cecil has seen diseases due to infections take a licking—tuberculosis, venereal disease, typhoid fever, diphtheria, most tropical diseases except leprosy. The problems of the future lie in conquering the chronic diseases, especially those due to degenerative processes. In 50 or 60 years, as Dr. Cecil points out, the body takes a beating and a battering; like an auto, some parts wear out. The body develops one or another of the degenerative diseases, such as heart disease, diabetes, hardening of the arteries (that may, in the brain, make an old man both silly and dizzy), or chronic joint diseases (that may make him limp). Why, some doctors once said, bother with an old car? In 1928 Dr. Cecil himself was not too cheerful about some aspects of aging and could wind up his paper on arthritis with: "We may say that the best friends of the elderly arthritic are rest, heat and aspirin." There is still a lot of truth in that statement, but elderly arthritics have more powerful friends now—the gold salts in which he pioneered as well as ACTH and cortisone.

Already, with a high-vitamin diet, the chances of alleviating cirrhosis of the liver are improving. And the date is not too far off, he thinks, when doctors will learn how to control high blood pressure. The thing to do is to get at the degenerative diseases early; early treatment is just as vital in the long run as it is for acute diseases like pneumonia. In the past, patients have been late in reporting symptoms, doctors late in starting treatment.

DR. Cecil, whose career has seen so much in medical advance, made his choice in a pretty haphazard way, he thinks now. He was born in Nicholasville, Kentucky, on October 13, 1881, and he still speaks with a slight southern accent. The LaFayette in his middle name is due to the fact that his great-great-grandfather on his mother's side was on the staff of the French general. It was a tradition of the family, like that of many others in the South, that the sons should enter professions—the army, law, ministry or possibly even politics. There were clergymen and doctors on both sides of his family and one uncle was a doctor. Cecil chose medicine, and has always been deeply happy in his choice. His son, and only child, Russell, has chosen another profession, that of architecture, and was graduated this year from the Yale School of Architecture.

Dr. Cecil received his early schooling at Pantops Academy in Charlottesville, Virginia, and then went on to Princeton, from which he was graduated *cum laude* in 1902. Then he went to the Medical College of Virginia, and got his medical degree in 1906; the college granted him his Sc.D. in 1928. His postgraduate study included work at Johns Hopkins Hospital, Allgemeine Krankenhaus in Vienna and the Charité Hospital in Berlin. At first he inclined toward pathology and was resident pathologist at the Presbyterian Hospital in New York from 1907 to 1910; then served there as assistant visiting physician from 1911 to 1916. Next he became instructor in clinical medicine at Columbia University, and went to Cornell University Medical School with the same title in 1916. From 1920 to 1933 he was assistant professor of clinical medicine at Cornell, and it was during that period that he conceived the idea for his textbook. In 1933 he was made professor of clinical medicine at Cornell, the position he still holds. He began a long connection with New York's famed Bellevue Hospital in 1916, serving as adjunct assistant visiting physician from that year to 1921. He was assisting visiting physician from 1921-1923 and visiting physician from 1939 to the present. Since 1943 he has been attending physician (now consulting physician) at New York Hospital.

Dr. Cecil has his offices in a five-story brown-



"Marble Quarry at Lee, Massachusetts," a painting in oils by Dr. Cecil.

stone building on New York's East 61st Street, within two blocks of Central Park. His winter home is two blocks away on the same street, but in summer he and his wife move out to Port Washington on the north shore of Long Island. He commutes daily by car, arriving about 9:30 A.M. Between that time and 2:00 P.M. he and his associate, Dr. William H. Kammerer, see about 20 patients. One afternoon a week he spends instructing young doctors at the Veterans Administration Hospital in the Bronx. Other afternoons he spends mostly in dictating medical articles, revising his textbook, etc. Two years ago he started work on a new book, "The Specialties in General Practice," to be published next spring; it will contain 15 chapters by 15 different authors. The specialties will be discussed for the benefit of the general practitioner, especially the G.P. in small towns, and will explain what he can do without calling in a specialist. Dr. Cecil himself is writing only the preface, but he finds he has considerable editing to do; just avoiding duplication with *Cecil* means a lot of work. Later in the afternoon he may call on private patients in hospitals. But in summer he usually manages to start the hour's drive to Long Island by 4:30.

The walls of the corridor leading to his third-floor office are hung with diplomas, etc. One document with a plain red pen attached is signed by former New York Governor Herbert Lehman and states: "This is to certify that the pen hereunto affixed was used by me in approving Assembly Bill. . . ." The bill, backed by Dr. Cecil, carried an appropriation for the study and treatment of

pneumonia, including (this was April, 1937) the purchase of pneumonia serum.

There is also a citation from President Truman for service in the World War II draft, a certificate of membership from the honorary fraternity Alpha Omega Alpha, a page of field orders written at Valley Forge on June 15, 1777, and initialed simply "G.W., C.I.C." (for George Washington, Commander-in-Chief), which came down through Dr. Cecil's family, a letter of introduction from Woodrow Wilson while he was president of Princeton, and the following letter to Dr. Cecil's father from Wilson:

"My Dear Dr. Cecil: I write to ask you if you will not give us the pleasure of hearing you in our chapel pulpit on Sunday, May 22? I am sure that your son would be glad to see you and that we should all be no less so.

"The honorarium which we are accustomed to pay is $50, which I trust would be sufficient to cover your expenses, and I should hope that you would be my guest during your stay here. Mrs. Wilson is away from home and is not to be back until the eve of Commencement, but I think that I can promise you some square meals and a good bed."

One thing is missing from the office walls: any sample of Dr. Cecil's paintings. He started painting four years ago, and, like many other doctors, has found it a rewarding hobby. His favorite subjects are landscapes, and he usually paints in oil; one of his canvases, depicting a marble quarry in Massachusetts, was hung at a members' exhibit in New York's Century Club, but he has never exhibited at A.M.A. conventions. Painting, he finds, "is an act of concentration"; Winston Churchill may seek relaxation in painting, Dr. Cecil says, but he finds it an effort. But he expects to devote more of his time to painting as he grows older.

His favorite form of relaxation now is golf, and he manages to play twice a week in good weather. In 1948 his wife wrote a semi-humorous biography of her husband for the medical fraternity of which he is a member, Phi Chi. She said of his hobbies:

"Like all busy people, he has time for everything, even for playing golf with his wife! Golf is his passion and his hair shirt. My private opinion is that he would rather be a good golfer than a good doctor, but since his golfing game is in the nineties, with an occasional peek into the eighties, it will be seen that this is an ambition unrealized. Two years ago this man of many surprises decided to take up painting, and armed with a box of oils and the necessary brushes he rushed in where angels fear to tread and has now proudly signed his name to several creditable efforts."

At his Long Island summer home, Dr. Cecil spends his time practicing golf shots rather than fishing, but does take time out from golf for a swim almost every day. At his home in town he spends most of his evenings reading; he is not, he explains, one of those doctors who like to go night-clubbing as they grow older. He prefers winter vacations, and has visited Florida, Nassau, Cuba, and Puerto Rico. But he gets restless after about three weeks and becomes anxious to return to New York and to work.

Dr. Cecil, energetic and enthusiastic, belongs to many organizations, including the American Rheumatism Association (president 1937-1938), New York Rheumatism Association (president 1942-1943), American College of Physicians, American Medical Association (chairman of the Medical Section, 1928-1929), and many others. He has, furthermore, been active on a variety of committees in those organizations of which he is a member. He also belongs to many clubs, among them the Century Club, Union Club, New York Chapter of the Sons of the Revolution, Deepdale Golf Club and Piping Rock Club, of Locust Valley, Long Island.

Beside his books and monographs, he has written for many medical journals and in addition to his positions at New York and Bellevue Hospitals, he is consultant in medicine at the New York Infirmary for Women and Children, Nyack Hospital at Nyack, New York, Northern Westchester Hospital at Mt. Kisco, New York, and St. Mary's Hospital and Passaic General Hospital, Passaic, New Jersey.

His medical hobby right now is the Arthritis and Rheumatism Foundation. He is chairman of the Foundation's medical and science committee and president of the New York State Chapter. He is proud of the fact that the Foundation raised $500,000—for research into the disease and care of its victims—in its first drive in 1948, $750,000 in the drive last year. This year, he hopes, the amount will exceed $1,000,000.

Dr. Cecil would sum up his career so far under three main points: research in pneumonia, research in arthritis, and then—third—his world-famed textbook.

Mrs. Cecil, in the Phi Chi *Quarterly,* sums up her husband like this:

"If I have sounded too biased, let me assure his fraternity brothers that he has all the usual foibles. His son is *his* son when he gains some honor; he is *mine* when he overdraws his allowance or goes off with the family car! He grumbles about his food, but makes no allowance for the fact that he is late for dinner.

"He loves lobster and good wine, good company, and of course all Phi Chis! He is impatient of stupidity, unforgiving of unreliability, and deeply resentful of careless medical practice. He is human because he is humorous. In my lexicon, a sense of humor presupposes a sense of proportion, and this is and always will be his outstanding characteristic."

George R. Burns

Consultation Service

This special consultation information service is offered as a regular monthly feature of *Postgraduate Medicine*. Subscribers are invited to call on this Service for answers to difficult medical problems from members of our Editorial Board and our Editorial Consultants best qualified to help. Each question will be answered by mail and those of general interest will be published each month. Address all communications to Consultation Service, *Postgraduate Medicine*, 516 Essex Building, Minneapolis 3, Minnesota.

ULTRAVIOLET IRRADIATION OF EMPLOYEES IN INDUSTRY

QUESTION: I would like to have your opinion as to the value of ultraviolet irradiation of employees in industries. As medical consultant to an aluminum reduction plant, I have been asked the value of fluorescent sun lamps in the rest rooms where the employees sit for approximately 15 minutes per hour.

M.D.—Quebec

ANSWER: To simply have fluorescent sun lamps in a rest room where employees sit clothed would be of no practical value, since not enough of the ultraviolet would be received by the body.

If the employees were receiving sufficient ultraviolet to be of significance they would be subject to conjunctivitis if their eyes were not properly protected. In order to make the ultraviolet of real worth, the installation would have to be properly controlled so that employees received known doses of ultraviolet in a specified time. The intensity of the ultraviolet varies inversely as the square of the distance from the source, and therefore a person closer to the lamp would receive much more than one a little farther away. In my judgment, therefore, and that of my consultant in physical medicine, such an uncontrolled method of irradiation would be of no value and would have potentialities for producing ultraviolet conjunctivitis.

H. DABNEY KERR

WHEN SHOULD AMBULANCE BE USED?

QUESTION: Is transportation by automobile to a nearby hospital considered as safe as by ambulance for "acute abdomens," strokes and pneumonias—assuming no shock exists and no walking occurs? Please define the conditions aside from bleeding, shock and fractures which would be aggravated by car transportation.

M.D.—Pennsylvania

ANSWER: There is general agreement that transportation of acutely ill patients is safer and more comfortable for the patients if an ambulance is used. In many instances, the decision to convey patients by automobile is decided upon for nonmedical reasons such as difficulty in getting an ambulance, the patients' desires to go in their own cars, and finally because of the economic factor of greatly increased expense.

There is real difficulty in placing a seriously ill patient in a car and removing him. Even though no shock is evidenced at the time the decision is reached to take the patient to the hospital, it may develop in such conditions as acute pancreatitis, perforated peptic ulcer, ruptured appendix or ruptured ectopic pregnancy. Certainly in doubtful patients, a patient is safer and more comfortable in the reclining position. Furthermore, ambulance services offer trained personnel for the safest conveyance of patients. Intracranial injuries, possible cord injuries, patients with perforated hollow viscus or with signs of generalized peritonitis should be moved by ambulance. It is, of course, evident that a patient with concealed bleeding, shock or those with fractures should be so transported.

RICHARD B. CATTELL

REACTION TO PENICILLIN

QUESTION: A patient developed a hive and arthritic reaction one week after an injection of hypercillin (300,000 units of penicillin in oil with 2 per cent aluminum monostearate). How can one guard against such a reaction (to the oil or the penicillin) in future patients?

M.D.—Ontario

ANSWER: Scratch, intradermal or conjunctural tests with diluted material should be tried. If positive, antihistamine therapy should be added to the penicillin therapy.

I doubt very much if the "oil with 2 per cent aluminum monostearate" had anything to do with the resultant delayed reaction. The initial reaction is fairly easy to control but subsequent use of the drug should be eliminated.

HARRY L. ROGERS

TREATMENT FOR ENDOMETRIOSIS

QUESTION: A female, age 22, nulliparous, weight 117 pounds, height 5 feet 5 inches, has had dysmenorrhea since menses began. Her periods are regular, flowing four to five days; total amount of flow could probably be absorbed by one napkin. She has a fair complexion, very feminine—no excessive hair; she was first seen by me on July 24, 1950. Her complaints simulated an acute appendicitis. Surgery was performed and a ruptured left chocolate ovarian cyst was noted with typical peritoneal hyperemia as described by textbook. The appendix was practically covered by peritoneal fold but distal portion contained fecaliths and appeared hyperemic. The appendix and cyst were removed. A definite infantile uterus was noted somewhat larger than a thumb. Patient has had no discomfort since surgery. The problems are: the prognosis and further treat-

ment of endometriosis. Specific therapy and prognosis for the infantile uterus in regards to influencing chance of pregnancy such as detailed hormone treatment.

M.D.—California

ANSWER: Conservative surgery in endometriosis is wise and is advisable in an effort to preserve reproductive function. If it is at all possible, this patient should be advised to have her family now and within the next few years, since in all likelihood a recurrence of the endometriosis will necessitate further surgery at a later date. In the meantime, since this patient is of fair complexion, quite feminine and does not have excessive hair growth on the face or body, she may be treated for the dysmenorrhea with androgens. To this end, she might be given 25 mg. of testosterone propionate at weekly intervals for periods of four to five months, followed by therapy-free intervals of one or two months. This regimen does not interfere with ovulation nor does it minimize the chance for conception. In fact, many patients with endometriosis so treated do conceive.

I do not believe that an infantile uterus in a woman who menstruates regularly plays as great a role in sterility as one has been led to believe.

ROBERT B. GREENBLATT

TREATMENT OF PAINFUL BREASTS

QUESTION: Please give me information on treatment for painful breasts: (1) those pains near menstrual period; (2) those tender all the time; (3) Schimmelbusch's disease.

M.D.—Mississippi

ANSWER: The treatment of the patient with painful breasts is predominantly conservative regardless of whether the pain is continuous or cyclic. If a careful examination of the breasts fails to reveal any signs suggestive of malignancy, this point is stressed in the discussion with the patient, for it will be found that many patients with minimal discomfort are fearful of cancer and it is this fear rather than the pain which causes them to consult the physician.

At the conclusion of the examination the patient should be asked to put on her breast support and this should be carefully inspected to see if it properly elevates the breasts without compressing them against the chest wall. An adequate support is an essential part in the management of these patients, and the heavier and more pendulous the breasts the more important it becomes. If the breasts are pendulous the support should be worn at night as well as during the day. The above recommendations will be found to be adequate in the majority of cases.

Various medications have been recommended from time to time but none is uniformly successful. Progesterone in 5 mg. doses may be injected twice a week for the two weeks preceding the menstrual period, the course being repeated for two or three menstrual cycles. Ovarian residue, 5 gr. two or three times a day by mouth, may be given for the week preceding the period.

Surgery is rarely indicated. It is resorted to chiefly for the removal of a solitary nodule or any suspicious area in which malignancy cannot be clinically excluded. The presence of pain never excludes the diagnosis of malignancy. Simple amputation of the breasts for the relief of pain is a last resort and is rarely indicated. Those breasts which may require amputation for the relief of pain are usually small and are diffusely hard and "shotty" on palpation. The pathologist's diagnosis in such cases will frequently be Schimmelbusch's hyperplasia.

JAMES R. WATSON

IMMUNIZATION FOR INFANT GOING TO MEXICO

QUESTION: What would be your recommendations for the immunization of a 3-month-old infant who is taking a trip with her parents to Mexico City in about two months?

Should the diphtheria-pertussis-tetanus injections be started immediately so that some degree of immunity be attained or should these be deferred? Should any form of typhoid-paratyphoid injections be given?

Vaccination, of course, is required by law so there is no question about that.

M.D.—Wyoming

ANSWER: The best protection for the baby is to be sure that her regular formula (unless breast fed) is made from boiled milk and the sugar added be from a clean source, according to the formula the baby is on. She may have fresh orange juice—properly prepared by the mother herself. The outside of the orange should be cleansed for just an instant with hot water and the orange peeled or a squeezer used. Anything that has been canned—particularly in America—is usually all right. She may have canned pureed vegetables and strained meat such as Gerber's or Swift's. All water should, of course, be boiled.

There is, of course, some danger of infection. Ordinarily, a baby this age is too young to be immunized but if they are going to be there for some time, or if the care of the infant is to be entrusted to a native servant, it would be well to give the baby some typhoid-paratyphoid injection and that should be done soon. The infant should be vaccinated, of course—that is required. If the baby hasn't had her diphtheria, pertussis and tetanus injections yet, it would be well to give them and to do so before giving the typhoid-paratyphoid. Cleanliness and prevention are the best protection. An injection for dysentery would be desirable but those tried have not been very successful.

IRVINE MCQUARRIE